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MARIHUANA-HASHISH EPIDEMIC AND ITS IMPACT ON UNITED STATES SECURITY

HEARINGS

BEFORE THE

SUBCOMMITTEE TO INVESTIGATE THE ADMINISTRATION OF THE INTERNAL SECURITY ACT AND OTHER INTERNAL SECURITY LAWS

OF THE

COMMITTEE ON THE JUDICIARY UNITED STATES SENATE

NINETY-THIRD CONGRESS

SECOND SESSION

MAY 9, 16, 17, 20, 21, AND JUNE 13, 1974

Printed for the use of the Committee on the Judiciary

Y 4. J 89/2
M 33

U.S. GOVERNMENT PRINTING OFFICE
33-371 O WASHINGTON : 1974

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RESOLUTION

Resolved, by the Internal Security Subcommittee of thhe Committee on the Judiciary, That the testimony of Dr. Hardin B. Jones taken in executive session on May 21, 1974, and the testimony of Dr. Forest S. Tennant and David O. Cooke taken in executive session on June 13, 1974, be released from the injunction of secrecy and printed in the same volume with the public hearings of May 9, 16, 17, and 20, 1974, all on "The Marihuana-Hashish Epidemic and Its Impact on U.S. Security."

JAMES O. EASTLAND,
Chairman.

Approved: September 4, 1974.

Y 4.J 89/2:M 34/2

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INTRODUCTION

BY

SENATOR JAMES O. EASTLAND

Chairman, Senate Subcommittee on Internal Security

I consider the hearings which are the subject of this record to be among the most significant ever held by the Senate Internal Security Subcommittee, or, for that matter, by any committee of Congress. The widespread interest already generated by the hearings suggest that they may play a role in reversing a trend towards national disaster.

Without public awareness, our country has become caught up in a marihuana-hashish [1] epidemic that probably eclipses, in gravity, the national epidemics that have had so debilitating an effect on the population of a number of Middle Eastern countries. Speaking about this matter, Mr. Andrew C. Tartaglino, Deputy Administrator of the DEA, made this statement at the opening hearing on May 9, over which I presided:

> The traffic in, and abuse of, marihuana products has taken a more serious turn in the last two or three years than either the courts, the news media, or the public is aware. The shift is clearly toward the abuse of stronger, more dangerous forms of the drug which renders much of what has been said in the 1960's about the harmlessness of its use obsolete.

The epidemic began at Berkeley University at the time of the famous 1965 "Berkeley Uprising." Not only was pot-smoking embraced as a symbolic rejection of the establishment, but, together with the "dirty speech movement," the right to pot became an integral part of the catalogue of demands of the uprising. From Berkeley, the marihuana epidemic spread rapidly throughout the American campus community. Then it spread down into the high schools and junior high schools—and within the last year or two it has begun to invade the grade schools. It has also spread into the ranks of professional society and of the bluecollar workers, so that all sectors of our society are today affected by the epidemic. Today it is estimated that there are some millions of regular marihuana users in the country, and the evidence indicates that they are graduating rapidly to the stronger hemp drugs, hashish and liquid hashish.

The spread of the epidemic has been facilitated by the fact that most of our media and most of the academicians who have been articulate on the subject have been disposed to look upon marihuana as a rela-

[1] Marihuana and hashish are both derived from the cannabis, or hemp, plant. Marihuana consists of the leaves and female flowers; hashish comes from the resin of the plant. Hashish is roughly 8 to 10 times as strong as marihuana.

tively innocuous drug. (How the myth of harmlessness came to be so widely accepted is also part of the subject of this testimony.) There were some who even held that marihuana was a good thing, while most held that there really wasn't too much to worry about.

Taking advantage of the confusion and widespread ignorance, a variety of movements seeking the legalization of marihuana came into existence. They gathered strength rapidly. In fact, by early this year concerned scientists and government officials were almost ready to throw in the sponge because the battle looked so hopeless.

This situation, by itself was reason enough for concern. The Internal Security Subcommittee decided to look into it because of internal security considerations affecting the armed forces of the United States, and because of the evidence that clearly subversive groups played a significant role in the spread of the epidemic—both as propagandists and as traffickers. It was established, for example, in previous hearings of the subcommittee, that Timothy Leary's Brotherhood of Eternal Love had for a number of years been the largest producers of LSD and the largest organized smugglers of hashish in the country.

The hearings focused heavily on scientific evidence of physical or psychological harmfulness, because this was basic to any assessment of the impact of cannabis on security.

Important new scientific evidence had emerged within the last few years. But this evidence remained fragmented, sometimes inconclusive, and almost invariably completely unknown to the public. The situation was further confused by contradictory evidence and by the emergence of several best-selling books suggesting a more tolerant approach to marihuana.

One of the principal reasons why hard scientific evidence has been so slow in emerging is that it is only within recent years—in fact, since 1970—that accepted procedures for the quantitative analysis of marihuana have been established and that carefully standardized strains of marihuana have become available for research purposes. In the absence of standardized research materials and standardized analytical procedures, research scientists in the past, working with the utmost conscientiousness, often came up with sharply conflicting findings. Within the last few years, thanks to a remarkable program that has been developed at the University of Mississippi,[2] marihuana research is today moving forward without these handicaps—and, as this volume of testimony dramatically demonstrates, this research is producing some highly dramatic results.

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[2] The program is known as the Marihuana Project of the Research Institute of Pharmaceutical Sciences, which is part of the School of Pharmacy at the University of Mississippi. The program was established in 1968, as part of a national program of research, by Dr. Coy Waller, formerly Vice President in Charge of Research at Meade-Johnson and consultant to the National Institute of Mental Health, who today serves as the Director of the Research Institute. The first Director of the Marihuana Project, from 1968 to 1971, was Dr. Norman Doorenbos. Since 1971, it has been under the direction of Dr. Carlton Turner, who also serves as Associate Director of the Research Institute.

In addition to standardizing the marihuana used for research purposes, Dr. Turner's scientists have developed analytical methods which enable them to give accurate readings on ten different cannabinoids contained in marihuana samples—a few years ago, they were able to analyze for only three cannabinoid components. The marihuana the Institute cultivates is now used routinely for all research projects sponsored through the National Institute of Mental Health, while the United Nations Narcotics Commission has recommended that the analytical procedures developed at the University of Mississippi be used worldwide.

If today we know far more about marihuana than we did two or three years ago, it is thanks in large measure to the pioneering work done at this internationally unique research center.

In the recent hearings, it was obvious that one of the first things that had to be done was to bring together the bits and pieces of recent research in an organized manner, because only in this way would the total significance of these findings become comprehensible. The subcommittee, therefore, issued invitations to some 20 prominent medical researchers and psychiatrists. Most of them were American, but six other countries were also represented in the panel of scientists. The pro-marihuana cabal could assail a single scientist whose research persuaded him that marihuana was a very dangerous drug: this they could get away with. But abuse and character assassination would no longer be persuasive at the point where it was demonstrated that a large number of top-ranking scientists who had done research on cannabis were convinced that it is a drug with deadly consequences.

With the assistance of several scientists who are internationally known for their research on cannabis and other drugs, the subcommittee staff put together a master list of scientific witnesses who, between them, could cover the newly available scientific evidence in a broad spectrum manner.

Among the eminent scientists who appeared before the Subcommittee were:

Dr. Harvey Powelson: Research Psychiatrist, Berkeley University; Chief of the Psychiatric Division of the Student Health Service at Berkeley from 1964 to 1972.

Dr. Henry Brill: Regional Director of the New York State Department of Mental Hygiene; member and/or chairman of drug dependence committees of American Medical Association, National Research Council, the World Health Organization, and the FDA; senior psychiatric member of the Shafer Commission.

Dr. Donald Louria: Chairman, Department of Preventive Medicine and Community Health, New Jersey Medical School; Chairman and President, New York State Council on Drug Addiction, 1965 to 1972.

Professor W. D. M. Paton: Head of the department of pharmacology at Oxford University; Chairman of committee overseeing the British Government's drug research program; author of a standard textbook on pharmacology and widely recognized as one of world's leading pharmacologists.

Professor Morton Stenchever: Chairman of the Department of Obstetrics and Gynecology at the University of Utah Medical School.

Dr. Gabriel Nahas: Research Professor at the Columbia University College of Physicians and Surgeons; simultaneously Visiting Professor at the University of Paris.

Dr. Akira Morishima: Research geneticist; Associate Professor, Department of Pediatrics, Columbia University College of Physicians and Surgeons; Chief of the Division of pediatric endocrine service at Babies Hospital, New York.

Dr. Cecile Leuchtenberger of Switzerland: Head of the Department of Cell Chemistry at the Institute for Experimental Cancer Research in Lausanne; founder and first Director of Cell Chemistry Department at Western Reserve University.

Dr. John A. S. Hall: Senior Physician and Chairman, Department of Medicine, Kingston Hospital, Jamaica, since 1965: Associate Lecturer in Medicine, University of West Indies and visiting Assistant Professor of Neurology at Columbia University.

Dr. Robert Kolodny: Director of the endocrine research section at the Reproductive Biology Research Foundation in St. Louis.

Professor M. I. Soueif: Chairman of the Department of Psychology and Philosophy at Cairo University; member of World Health Organization Panel on Drug Dependence; author of classic study on consequences of hashish addiction in Egypt.

Professor Nils Bejerot: Karolinska Institute, Sweden; author of "Addiction and Society" and several other standard texts on the epidemiology of drug abuse. Widely recognized as one of foremost international experts in this field.

Dr. Andrew Malcolm: Toronto psychiatrist; member, Drug Advisory Committee, Ontario College of Pharmacy; formerly Senior Psychiatrist, Rockland State Hospital, New York (1955–1958).

Dr. Harold Kolansky: Currently Associate Professor of Psychiatry at the University of Pennsylvania School of Medicine; twice President of the Regional Council (Pennsylvania, New Jersey, Delaware) of Child Psychiatry; Director of Child Psychiatry, Albert Einstein Medical Center, Philadelphia, 1955–1969; Chairman, Department of Psychiatry, Albert Einstein Medical Center, 1968–1969.

Dr. William T. Moore: Currently Associate Professor in Clinical Psychiatry, University of Pennsylvania School of Medicine; Associate Professor of Child Psychiatry at Hahnemann Medical College for 13 years up until 1972; for the past five years Director of Training, Division of Child Analysis, Institute of Philadelphia Association for Psychoanalysis.

Professor Robert Heath: Chairman of the Department of Psychiatry and Neurology at Tulane University Medical School.

Dr. Phillip Zeidenberg: Professor of Psychiatry at Columbia University; Chairman of the Drug Dependence Committee of the New York State Psychiatric Institute.

Dr. Julius Axelrod. Nobel Prize winning research scientist at the National Institute of Mental Health.

Professor Hardin B. Jones: Professor of Physiology and Professor of Medical Physics at the University of California, Berkeley; Assistant Director of the Donner Laboratory of Medical Physics at Berkeley.

Dr. Conrad Schwarz: Associate Professor, Department of Psychiatry, University of British Columbia and Consultant Psychiatrist to the Student Health Service; Chairman of the Drug Habituation Committee of the British Columbia Medical Association.

Dr. Forest S. Tennant, Jr.: Medical Director for several drug abuse programs in the Los Angeles area; officer in charge of the drug abuse program of the U.S. Army Europe, 1971–1972.

THE SCIENTIFIC FINDINGS

That our hearings succeeded in achieving their objective has been demonstrated by the dramatic increase of interest, on the part of the scientific community as well as the press, in the new scientific evidence on marihuana. For example, a recent issue of *Science* magazine (August 23, 1974) points out "the notion that marihuana is harmless has enjoyed a high degree of acceptability with only a minimum of scientific support. . . . Since 1969, when the federal government began making marihuana of controlled quality available to research scientists, evidence suggesting potential hazards has accumulated at a

rapid pace. Those five years of research have provided strong evidence that, if corroborated, would suggest that marihuana in its various forms may be far more hazardous than was originally suspected." I think it worthy of note that ten of the scientists whose findings were quoted by the article in *Science* were among the witnesses who testified in the subcommittee's recent hearings.

The collective testimony of the eminent scientists who came to Washington to testify may be summarized as follows:

(1) *THC, the principal psycho-active factor in cannabis, tends to accumulate in the brain and gonads and other fatty tissues in the manner of DDT.* This was established beyond challenge by the research of NIMH Nobel Laureate, Dr. Julius Axelrod, and his associates. As a corollary of this, they found that THC persists in the body long after the act of ingestion. In some parts of the body, residual amounts could be found as much as a week after ingestion.

(2) *Marihuana, even when used in moderate amounts, causes massive damage to the entire cellular process:*

(a) It reduces DNA and RNA synthesis within the cell, which in turn sharply reduces the mitotic index, or the rate at which the cells give birth to new cells. (Nahas, Morishima, Zimmerman, Leuchtenberger, Paton)

(b) In the case of the T-lymphocytes (the cells involved in the immune process), marihuana use at the three-times-a-week level results in a 41 percent reduction in cell birth. (Nahas and associates)

(c) It results in far more cells with defective chromosome complements—from 38 to 8 chromosomes instead of the normal complement of 46. (Morishima)

The findings of five of the scientists who testified converged on the central theme of cellular damage. Other research that had been done in this field was also referred to. Professor W. D. M. Paton of Oxford University, one of the world's leading pharmacologists, summarized this recent research in these terms:

> Numerous such effects have now been described, including actions on microsomes, on mitochondria, on neurones, fibroblasts, white blood cells, and on dividing cells, affecting metabolism, energy utilization, synthesis of cellular constituents, and immunological responses.

On the specific question of cellular damage, additional evidence is becoming available almost by the week. Since Dr. Nahas testified, for example, his findings on damage to the immune cells have been confirmed by two nationally prominent medical scientists, Dr. Louis Harris and Dr. Louis Lemberger. Other aspects of cellular damage will be covered in several research papers, prepared under official auspices, which are shortly to be published.

Needless to say, the confirmation that marihuana does such serious damage to the entire cellular process opens up an entire spectrum of frightening possibilities.

(3) *Tied in with its tendency to accumulate in the brain and its capacity for cellular damage, there is a growing body of evidence that marihuana inflicts irreversible damage on the brain, including actual brain atrophy, when used in a chronic manner for several*

years. Psychiatrists who testified said that they knew of many cases of brilliant young people who went on prolonged cannabis binges, and then tried to go straight—only to discover that they could no longer perform at the level of which they had been capable. (Heath, Powelson, Kolansky and Moore, Paton) Professor Paton referred to animal experiments which demonstrated that rats exposed to marihuana had smaller brains than rats which were not exposed, and to research by Dr. Campbell and associates in England which found brain atrophy in a group of young cannabis smokers comparable to the atrophy that is normally found in people aged 70 to 90. Professor Heath reported that, in experiments with rhesus monkeys exposed to marihuana, highly abnormal brain wave patterns persisted after the marihuana was withdrawn, suggesting long-term or permanent damage to the brain.

(4) *There is also a growing body of evidence that marihuana adversely affects the reproductive process in a number of ways, and that it poses a serious danger of genetic damage and even of genetic mutation.* Scientific testimony presented pointed to the following conclusions:

(a) Male hormone (testosterone) level was reduced by 44 percent in young males who had used marihuana at least four days a week for a minimum of six months. (Kolodny)

(b) Sperm count was dramatically reduced in the same group of marihuana smokers, falling almost to zero with heavy smokers, so that they had to be considered sterile. (Kolodny) A similar result was found with mice. (Leuchtenberger)

(c) Very heavy smoking in a number of cases resulted in impotence. Potency was recovered in some of these cases when marihuana was given up. (Kolodny, Hall)

(d) In animal experiments, the spermatids (the precursors of the sperm cells) were found to be abnormal in the sense that they carried reduced amounts of DNA. (Leuchtenberger)

(e) Regular marihuana use, even down to the once a week level, results in roughly three times as many broken chromosomes as are found in non-users. While further research is necessary, this suggests the possibility of genetic abnormalities. (Stenchever)

(f) In a number of animal experiments, marihuana was found to cause a very high rate of fetal deaths and fetal abnormalities, including runting and lack of limbs—the thalidomide effect. (Paton)

(5) *Chronic cannabis smoking can produce sinusitis, pharyngitis, bronchitis, emphysema and other respiratory difficulties in a year or less, as opposed to ten to twenty years of cigarette smoking to produce comparable complications.* (Tennant, Paton, Kolansky and Moore) Professor Paton pointed out that emphysema, which is normally a condition of later life, is now cropping up with increasing frequency in young people, opening up the prospect of "a new crop of respiratory cripples" early in life.

(6) *Cannabis smoke, or cannabis smoke mixed with cigarette smoke, is far more damaging to lung tissues than tobacco smoke alone. The damage done was described as "pre-cancerous."* (Tennant, Leuchtenberger) Although further research is indicated, preliminary observa-

tions suggest that marihuana may be a far more potent carcinogen than tobacco.

(7) *Chronic cannabis use results in deterioration of mental functioning, pathological forms of thinking resembling paranoia, and "a massive and chronic passivity" and lack of motivation—the so-called "amotivational syndrome."* (Powelson, Bejerot, Zeidenberg, Malcolm, Schwarz, Jones, Kolansky and Moore, Hall, Soueif, Tennant)

Describing the zombie-like appearance of chronic cannabis users, Dr. Tennant said: "Major manifestations were apathy, dullness and lethargy, with mild to severe impairment of judgment, concentration and memory . . . physical appearance was stereotyped in that all patients appeared dull, exhibited poor hygiene, and had slightly slowed speech. . . ."

Several psychiatrists suggested that the total loss of their own will would make a large population of cannabis users a serious political danger because it makes them susceptible to manipulation by extremists. (Powelson, Kolansky and Moore, Malcolm)

THE SOCIAL CONSEQUENCES OF THE MARIHUANA EPIDEMIC

The scientific evidence presented to the subcommittee points to an array of frightening social consequences, or possible consequences.

(1) If the cannabis epidemic continues to spread at the rate of the post-Berkeley period, we may find ourselves saddled with a large population of semi-zombies—of young people acutely afflicted by the amotivational syndrome. There is evidence that many of our young people, including high school and junior high school students, are already afflicted by the "amotivational syndrome." The general lack of motivation of the current generation of high school students is a common complaint of teachers. Some of them point out that the growth of this phenomenon in recent years has roughly paralleled the spread of the cannabis epidemic.

(2) We may also find ourselves saddled with a partial generation of young people—people in their teens and early twenties—suffering from irreversible brain damage. Their ability to function may improve if they abandon cannabis, but they will remain partial cripples, unable to fully recover the abilities of their pre-cannabis years.

(3) The millions of junior high school and grade school children who are today using marihuana may produce another partial generation of teenagers who have never matured, either intellectually or physically, because of hormonal deficiency and a deficiency in cell-production during the critical period of puberty. This fear was expressed in particularly urgent terms by Dr. Paton and Dr. Kolodny. As Dr. Paton put it, we may witness the phenomenon of a generation of young people who have begun to grow old before they have even matured.

(4) There are other frightening possibilities, too. There is the possibility of which Dr. Paton spoke that we may develop a large population of youthful respiratory cripples. And there is the possibility—which can only be confirmed by epidemiological studies—that marihuana smokers are producing far more than their quota of malformed or genetically damaged children.

(5) There is the growing body of evidence that marihuana use leads to indulgence in other drugs.

(6) If the epidemic is not rolled back, our society may be largely taken over by a "marihuana culture"—a culture motivated by a desire to escape from reality and by a consuming lust for self-gratification, and lacking any higher moral guidance. Such a society could not long endure.

These are some of the reasons why we cannot legalize marihuana, and why society cannot remain indifferent to the epidemic.

THE EPIDEMIC POTENTIAL OF CANNABIS

What makes the prospect even more terrifying is the extraordinary epidemic potential of cannabis. It is doubtful that any other drug in common use today has a comparable potential.

I do not underestimate the damage done by the abusive use of alcohol. But the nature of alcohol places certain limitations on its epidemic spread. It is impossible, or at least very difficult, to take a quart of whiskey or a six-pack of beer to one's place of work, or, in the case of a teenager or grade schooler, to take it to school. If one did take it to school or to work, it would be difficult to find the time during the work day or during school hours to get oneself really intoxicated on alcohol. And if a worker or a student did manage to get himself stoned on alcohol, he would be given away by his drunken stagger or by the smell of alcohol on his breath.

But with marihuana, there are no such limitations. It is cheap enough so that even a fourth or fifth grader can afford to buy a joint or two with his weekly allowance. It is compact enough so that a few joints can easily be concealed on the body. All it requires is a 10 or 15 minute break to get thoroughly stoned. And, apart from a tired and passive look which may suggest that the user is short on sleep, there are no telltale symptoms; the user, though stoned, does not walk with a stagger, nor is there any odor on his breath. A student could sit through an entire day in a cannabis stupor, and learn nothing—and his teacher would be none the wiser.

On top of this, users of marihuana suffer from a much more compelling urge to proselytize and involve others than do users of alcohol. One can attend a cocktail party and drink ginger ale and not be harrassed and pushed by one's cocktail friends to get in on the act and drink. At pot parties, the pressures are infinitely greater.

Another factor contributing to the spread of the cannabis epidemic is the tremendous potency of the material available and the ease with which it can be concealed and transported. A pound of "liquid hashish"—a concentrated distillate derived from either marihuana or hashish—would theoretically be enough to intoxicate a city of 15,000 people.

Still another factor is that, with marihuana and hashish, chronic abuse begins at a use level which would be insignificant with alcohol. A person who took a drink of whiskey once a week or even three times a week, would be considered a light drinker; it has yet to be argued that alcohol consumption at this level can do any damage. But a person who smokes marihuana three times a week or more is generally considered a chronic smoker; and there are some scientists who insist that even once a week smoking constitutes chronic use. In support of this contention, they point to the facts that THC persists in the

brain for a week or more after smoking, and that some of the research covered in our recent hearings found dramatic changes even at the once a week level (cf. Stenchever on chromosome damage).

Finally, there is the almost unbelievable rate at which—if it is readily available—a cannabis user can escalate from occasionl social use to chronic and massive abuse. It generally takes years before a chronic drinker escalates to a quart a day. But, according to Dr. Tennant, GI's who arrived in Germany as casual marihuana users, would a month or two later be consuming 50 or 100 grams—and in some cases up to 600 grams—of hashish monthly. Three grams of hashish a day, it should be pointed out, is roughly 12 times the amount required to produce a hashish intoxication.

WHERE THE EPIDEMIC STANDS TODAY

There are conflicting estimates of the number of chronic cannabis users in our country. According to some estimates, there are roughly 20 to 25 million people who have used marihuana in one degree or another, but only one to two million who may be considered regular users. According to the estimate of NORML (National Organization for the Reform of Marihuana Laws), the total number of Americans who have been exposed to marihuana runs close to thirty-five million, while the number of regular users is past the ten million mark.

Figures on seizures of marihuana and hashish submitted to our hearings by the Drug Enforcement Administration strongly suggest the validity of the higher estimate. According to DEA, federal seizures of marihuana over the past five years have increased tenfold, to a total of 780,000 pounds in 1973, while federal seizures of hashish over the same period of time increased twenty-five fold, to a total of almost 54,000 pounds. These figures do not include seizures by state and local law enforcement authorities. Assuming that ten times as much got into the country as was actually seized—a fairly conservative estimate—this would mean that total consumption of marihuana in 1973 was probably close to ten million pounds, while total consumption of hashish probably exceeded 600,000 pounds. (These estimates make some allowance for non-federal seizures—for which no figures are available.)

These are truly staggering quantities when one understands just how potent marihuana and hashish are and how little is required to become intoxicated. No one could possibly get intoxicated on an ounce or two ounces of hard liquor. An ounce of hashish with a 10 percent THC content is sufficient for a hundred intoxications; an ounce of marihuana with a 1.5 percent THC content is enough for roughly twelve intoxications. And when it comes to "marihuana oil," or "liquid hashish," as it is sometimes called, the THC content of which can run as high as 60 to 90 percent, we have a substance with an almost lethal potential for mass intoxication. One drop of liquid hash is enough to send the user into the stratosphere, while a pound of the strongest variety would be enough to intoxicate a population of 15,000.

These figures provide some clue—but only a partial clue—to the damage done by the massive quantities of marihuana and hashish consumed in our country last year.

THE EMERGENCE OF AN ALCOHOL-CANNABIS EPIDEMIC

It must be emphasized that those who are caught up in the cannabis epidemic are not using marihuana or hashish as a substitute for alcohol. With increasing frequency they are being consumed together. The scientists who testified before the subcommittee were agreed that adding marihuana to alcohol, or alcohol to marihuana, does not produce an arithmetic effect but a synergistic, or compounding, effect. The combination of the two intoxicants produces a far more potent and dangerous form of intoxication, whose short and long term consequences we still know very little about. While there are reported to be some 10 million problem drinkers in our country, the overwhelming majority of those who use alcohol are what we call social drinkers, who take it occasionally and with moderation. But at the point where a person takes one drink of whiskey with a joint of pot, we are no longer dealing with a social drinker—we are dealing with someone who is suffering from a highly dangerous form of intoxication.

In its own right, the scale of the current cannabis epidemic would give us plenty to worry about and so is the scale of alcohol abuse. The emergence of an alcohol-cannabis epidemic is even more worrisome.

THE MYTH OF HARMLESSNESS

The spread of the epidemic has been facilitated by the widespread impression that marihuana is a relatively innocuous drug. This impression has been shared by liberals and conservatives, by laymen and judges, and even by people actively involved in the war on drugs. For example, in March of 1973 an advisory committee consisting of some 40 prominent D.C. citizens filed a report urging the complete legalization of marihuana on the ground that:

> No demonstrable medical evidence is available to support the assertion that marihuana use is hazardous or detrimental to the physical or mental health of the user.

The widespread acceptance of the myth of harmlessness has been due to several things. Certainly a role of some importance was played by the militant pro-marihuana propaganda campaign conducted by many New Left organizations, by academicians sympathizing with the New Left, and by the entire underground press, ever since the Berkeley uprising.

Some of this propaganda was positively euphoric on the virtues of marihuana. Dr. Joel Fort of San Francisco, a member of the Sociology Department of the University of California and a former consultant on drug abuse to the World Health Organization, had this to say on the subject: "Cannabis is a valuable pleasure giving drug, probably much safter than alcohol, but condemmed by the power structure of our society." An article in "The Sciences" by L. Greenwald in 1968 went even further. "Marihuana," said Greenwald, "restores to the student his ability to feel in an often hostile environment, and the liberating action of that drug is going to allow him to experience more intimate social contact."

But the myth of harmlessness has been stimulated in even greater degree by a number of highly publicized writings and by reports, some

official, some unofficial, which have taken a rather benign attitude toward marihuana. A major role was also played by the generous attention which the media bestowed on militant drug enthusiasts like Timothy Leary and Jerry Rubin. The damage was further compounded by the virtual blackout imposed by much of our media—at least until recently—on adverse scientific evidence about the effects of marihuana. The result has been that Congress and the American public have been exposed for years to an appallingly one-sided presentation of the marihuana controversy.

Another factor contributing to the myth of harmlessness was the selective manner in which the Shafer Commission Report was handled by the media. This report, as several witnesses pointed out, contained a number of apparently contradictory passages, which made it possible to write a story suggesting caution or to write one suggesting that its emphasis was on tolerance. But it did contain quite a number of fairly strong cautionary passages. It was for the purpose of setting the record straight on the Shafer Commission Report that one of the first witnesses heard by the Subcommittee was Dr. Henry Brill, who had served as senior psychiatric member of the Commission. This is what Dr. Brill had to say on the subject:

> I am concerned about the misinterpretations which have developed with respect to the marihuana report of that Commission. These misinterpretations result from reading the reassuring passages in the report and ignoring the final conclusions and recommendations, and the passages in the report on which they were based. As a result it has been claimed that the Commission's report was intended to give marihuana a clean bill of health, and as a covert, or indirect support for legalization of this drug in the near future, or as a step in that direction. Nothing could be further from the truth.
>
> From my knowledge of the proceedings of the Commission, I can reaffirm that the report and the subsequent statements by the Commission meant exactly what they said, namely that this drug should not be legalized, that control measures for trafficking in the drug were necessary and should be continued, and that use of this drug should be discouraged because of its potential hazards.

It was because of this pervasive imbalance in dealing with the question of marihuana that so many intelligent people have been under the impression that the scientific community regards marihuana as one of the most innocuous of all drugs. Part of the purpose of our recent hearings was to correct this imbalance—to present the "other side" of the story—to establish the essential fact that a large number of highly reputable scientists today regard marihuana as an exceedingly dangerous drug. We make no apology, therefore, for the one-sided nature of our hearings—they were deliberately planned this way.

MARIHUANA AND THE LAW

In previous statements, I have made it clear that I am opposed to the decriminalization of marihuana use and that I believe some penalties have to be retained. However, a man would have to be devoid

of compassion if he did not sympathize with the plight of a youthful offender who was caught smoking marihuana because he succumbed to peer pressures or to the bad advice he received from older students and from a small but vociferous group of academicians. (The academic propagandists for marihuana are protected by the First Amendment, but in my judgment they are far more culpable than the young people who have heeded their advice!) In most cases involving youthful offenders, especially first offenders, the purpose of justice is not served by sentencing them to prison and giving them criminal records. Our federal laws and many of our state laws have in recent years been modified in a manner that reflects a more compassionate approach, and the law is further tempered by the compassionate understanding which the great majority of judges have for the problems of young people.

Although there is still some unevenness in the state laws governing the use of marihuana and although there is always room for review and improvement, in practice very few young people are being sent to prison for simple possession of marihuana, especially when they are first offenders. On this point, there is such broad agreement that I feel it is no longer at issue.

But there is a militant lobby in our country which has been agitating and lobbying for the complete legalization of marihuana. As a stepping stone in that direction, they are working for the complete *decriminalization* of simple possession. This means that personal use of marihuana would no longer be covered by criminal law, that it would not even be considered a misdemeanor under the law. These matters still *are* at issue—and I truthfully believe that they cannot intelligently be decided without an assessment of the known and potential dangers posed by marihuana use.

Not all drugs are equal—no one, for example, has yet proposed that we deal with coffee and heroin, or tobacco and heroin, in exactly the same manner. And the evidence I have presented in the preceding pages should be sufficient to establish that the dangers of cannabis are much closer to the dangers of heroin, in scope and quality, than they are to the admitted but far more limited dangers of coffee or tobacco—or, for that matter, alcohol.

The scientists who testified before the subcommittee were unanimous on the point that it made no sense to send young people to prison for simple possession of a few joints of marihuana. On the other hand, they were strongly opposed to legalization, and not one of them spoke in favor of decriminalization. They expressed the belief that it would seriously undercut any national effort to discourage marihuana use if all penalties were removed for simple possession, as the Shafer Commission had recommended—and which remains the continuing objective of the pro-marihuana lobby. Dr. Brill, who, as a member of the Shafer Commission, had voted in favor of eliminating all penalties, indicated to the subcommittee that he was now rethinking this recommendation.

Commenting on the proposal that the decision on whether or not to use drugs, and especially marihuana, should be left to the individual, Dr. Andrew Malcolm, a distinguished Canadian psychiatrist, called for a combination of education and the law. Said Dr. Malcolm:

> It is necessary to have some external restraint when, indeed, some of the people are incapable of exercising internal re-

straint. But those people who propose [that the matter be left to] "wise personal choice" usually are unalterably opposed to any kind of external restraint. It is very foolish, because what we need, in fact, is both of these elements.

Dr. Phillip Zeidenberg, Chairman of the Drug Dependence Committee of the New York State Psychiatric Institute, while he held that the marihuana epidemic could not be eradicated by legal measures alone, nevertheless strongly opposed legalization and said that there have to be some penalties for use. These were Dr. Zeidenberg's words:

> I believe that legalization will turn on a "green light" which will enormously increase the number of chronic heavy users, just as it has in every other country where de facto legalization exists. Once this happens, marihuana will become an integral part of our social structure and take on complicated social and symbolic significance, as tobacco and alcohol already have. Once this happens, it will be virtually impossible to remove it.
>
> Ultrapunitive measures taken against individuals occasionally using the drug can only lead to the backlash of pressure for legalization. Offenders should be given light, but significant sentences, enough to be a sufficient deterrent to repeated use. Chronic heavy users should be offered psychiatric treatment, not jail.... The job of the law is to find the appropriate deterrent so that the marihuana problem is kept as a minor drug-abuse problem without crucifying errant adolescents.

Warning about the drive to legalize cannabis in the United States, Professor Nils Bejerot of Sweden said:

> The demand for legalizing cannabis has been strongest in those countries which have had the shortest experience and the weakest forms of the drug. Correspondingly, I consider that as a psychiatrist one's attitude to cannabis becomes more negative the more one sees of its effects.
>
> If cannabis were legalized in the United States, this would probably be an irreversible process not only for this country and this generation, but perhaps for the whole of Western civilization. As far as I can see, another result would be a breakdown of the international control system regarding narcotics and dangerous drugs.

The pro-marihuana lobby brandishes the statistic that there were some 400,000 arrests nationwide for marihuana offenses last year. They do so in a manner which creates the impression that some 400,000 young people went to jail because they were caught with a few joints in their possession. The actual situation is quite different.

The number of arrests involving marihuana was very high, among other reasons because virtually every petty criminal arrested for shoplifting or burglary or mugging or other similar offenses had marihuana in his possession at the time of his arrest. But according to many reports, our law enforcement authorities—federal, state, and local—in most cases do not even bother to make arrests when they find young people smoking marihuana or in possession of less than an ounce.

The cases that do come to court for the most part receive suspended sentences or fines, while most states now have a provision in their laws,

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similar to the provision in the federal law, calling for the expunging of the record for first offenders after one year, if parole is satisfactorily completed.

However, the law is uneven from state to state. Some states, while they have the theoretical power to send first offenders to prison, in practice rarely use this power. But here and there, it must be conceded, simple possession is still punished by prison terms.

I believe it would be helpful in dealing with this situation if the federal law and state laws could be brought into basic harmony on the question of marihuana. I do not suggest that the states slavishly adapt their laws to the current federal model; in many respects, in fact, I think federal law has something to learn from existing state statutes.

There is one state statute that does not recommend itself as a model: that is the marihuana law recently adopted by the State of Oregon. Under this law, simple possession of small quantities of marihuana is not treated as a violation of the criminal law but as a civil violation—something akin to a parking ticket. While the maximum fine provided is one hundred dollars, in practice the fines imposed rarely exceed thirty dollars. And those thus fined, if they can afford it, can go on collecting marihuana violations just as freely as some chronic illegal parkers collect parking tickets.

This approach, I submit, is altogether too permissive and just doesn't take into account the serious social damage done by marihuana or the compelling need to protect society against the spread of the habit. It doesn't take into consideration the basic fact that all drug addiction—including marihuana addiction—is like a contagious disease. Society can't remain indifferent to the spread of this disease.

The law must be framed in a manner that makes it unmistakably clear to young people that smoking marihuana *is* a crime against society. This is something that decriminalization would completely destroy. I believe that the kind of escalated penalties provided by state law in New Mexico, to give one example, make much more sense. Under this law, the possession of one ounce or less for a first offender is punishable by a fine of $50 to $100 and/or 15 days in jail. The jail sentences are rarely imposed, but this much discretion is given to the judge. The penalty for repeat offenders is a fine of $100 to $1,000 and/or one year in jail. Suspended sentences are frequently given and there is provision for expunging the record after one year.

New legislation governing the use of drugs requires the most careful consideration by Congress because—as Dr. Bejerot pointed out concessions to tolerance, once made, are very difficult, if not impossible, to eradicate. However, as far as marihuana use is concerned, I believe that the philosophy guiding such legislation might well be based on the opinions expressed by Dr. Zeidenberg and the other scientists who testified before the subcommittee. I think there is much merit to Dr. Zeidenberg's proposal, for example, that instead of jail sentences, we might consider sending chronic abusers for a period of time to an institution where they will be given intensive education on drugs and psychiatric treatment if they need it.

When it comes to the pushers and the traffickers, I think our federal and state laws have got to be reinforced. I find it an outrage that, over and over again, criminals caught in the possession of hundreds and even thousands of pounds of marihuana get off with very light sentences or even with six months suspended sentence. For the pushers

and traffickers, there have got to be heavy minimum sentences, and they have got to be mandatory.

The suggestion has been made that it might help to break up the traffic in drugs if offenders at every level—users, pushers, and small and intermediate traffickers—could be assured of suspended sentences if they cooperated by identifying the source, or sources, from which they had obtained their drugs. This is a proposal which merits serious consideration.

There are some who argue that tough law enforcement is not the answer to the drug problem, that we won't be able to deal effectively with the drug problem until we eliminate our slums, eliminate poverty, eliminate unemployment, and create a social utopia. I am all in favor of doing everything we reasonably can do to improve the quality of our society. But the fact is that every year since the early sixties has witnessed a massive increase in the amount we spend for new social programs—and the same period of time has witnessed a staggering increase in our drug problem.

No drug problem has ever been controlled by decriminalization or by social reforms. In every country where the drug problems have been effectively controlled, it has been thanks to strong laws against both the use and sale of the drug. That is how it is controlled in Communist countries; and that is how it has been controlled in some non-Communist countries, both authoritarian and democratic. There is no serious drug problem, for the indigenous population or for the GI's, in either Taiwan or South Korea. Nor is there one in Japan. The contrast between Germany and Italy is most instructive in this connection. In Germany, where drug laws are lax and law enforcement ineffective because it is fragmented among the *Laender*, or states, there has been a runaway epidemic of hashish consumption among the American GI's. (According to Defense Department witnesses, this situation has now improved significantly—although it still remains serious.) In Italy, where the drug laws are much stronger, drug use among GI's has been kept to a minimal level. The GI's in both countries are basically the same. The difference is the law.

THE NEED FOR A NATIONAL EDUCATION PROGRAM

The scale of the marihuana-hashish epidemic makes it essential that we embark—with as little delay as possible—on a national educational program directed in the first place to our young people.

Can the facts that are assembled in this volume be communicated to young people who are disposed to be skeptical about information they receive from "the establishment?" I am convinced that this evidence *can* be communicated to young people and *can* influence them—because it is far more graphic, far more persuasive and far more authoritative than any information that has heretofore been available for marihuana education programs.

Dr. Forrest Tennant, who was in charge of the U.S. Army drug program in Europe from 1968 to 1970, told the subcommittee that at one point he had actually given up on anti-cannabis educational programs because the material at that time was not too persuasive, and while the programs discouraged some GI's, they stimulated the curiosity of others, so that there was no real net progress. He expressed

the conviction, however, that armed with the recent evidence that had been presented to the subcommittee by so many eminent scientists, it would be possible to mount an educational program that GI's would find credible. The fact is that no young person wants to run the risk of irreversible brain damage, and no young male wants his male hormone level reduced by more than 40 percent or his sperm count reduced to close to zero. Nor does any young person, boy or girl, want to run the risk of genetically damaged children. These are dangers that young people will respond to.

There is an even larger matter that should be considered by every young person who finds himself yielding to the temptation of drugs or to peer pressures. Whatever each of us does, affects, for better or for worse, all those around us. And the fact is that every young person who takes marihuana or hashish or other drugs, drags down not only himself, but drags down his friends, drags down his family, drags down his community, drags down his nation. I would commend to every young person who is prepared to stop and think the wise words of Dr. Gabriel Nahas, one of the eminent scientists who appeared as a witness before the Subcommittee:

> One may wonder... how long a political system can endure when drug taking becomes one of the prerequisites of happiness. If the American dream has lost its attraction, it will not be retrieved through the use of stupefying drugs. Their use only delays the young in their quest to understand the world they now live in and their desire to foster a better world for tomorrow.

A final word of an editorial nature. So many scientific papers and supporting documents were left with the subcommittee by the witnesses that the inclusion of all of them would have made this a document of almost prohibitive length. In the interests of economy, only a portion of these documents have been included in the Appendix. I particularly regret that it was not possible to include a bibliography of some 800 cannabis research papers which Professor W. D. M. Paton of Oxford prepared for the subcommittee, because this volume was already in page proof at the time of its arrival. I ask the indulgence of the scientists who gave supplementary material to the subcommittee which has not been included in the printed Appendix. Hopefully, this material can be included in a followup study or documentation.

On behalf of the subcommittee, I want to thank the many distinguished witnesses who gave so generously of their time to make these landmark hearings possible.

MARIHUANA-HASHISH EPIDEMIC AND ITS IMPACT ON UNITED STATES SECURITY

THURSDAY, MAY 9, 1974

U.S. SENATE,
SUBCOMMITTEE TO INVESTIGATE THE
ADMINISTRATION OF THE INTERNAL SECURITY ACT
AND OTHER INTERNAL SECURITY LAWS
OF THE COMMITTEE ON THE JUDICIARY,
Washington, D.C.

The subcommittee met, pursuant to notice, at 11 a.m. in room 2228, Dirksen Senate Office Building, Senator James O. Eastland presiding.

Present: Senators Eastland and Thurmond.

Also present: J. G. Sourwine, chief counsel, and David Martin, senior analyst.

Senator EASTLAND. The hearings on which we are embarking today deal with the "Marihuana-Hashish Epidemic and Its Impact on the United States Security." They represent an extension of the previous hearings the subcommittee has held on the world drug situation, which have already resulted in eight volumes of published testimony. In opening these hearings, I want to repeat just a few of the points I made in a statement I put out yesterday.

Over the past 5 years there has been a runaway escalation in the use of marihuana and hashish. What was once a campus phenomenon has moved down to the high schools and the junior high schools and the grade schools, and upward into the ranks of adult society.

The spread of the cannabis epidemic has been facilitated by a massive and perplexing imbalance in the published information generally available to the public on the subject of marihuana. There are competent scientists who believe that it is relatively harmless. On the other hand, there is a large body of scientists of international reputation whose research on cannabis has convinced them that it is a highly dangerous drug, and this in many different ways.

When a conflict of opinion exists within the scientific community on a question as important as marihuana, the Congress and the American people are entitled to a fair presentation of both sides to this controversy. In fact, however, there has been widespread publicity for writings and research advocating a more tolerant attitude towards marihuana—while there has been little or no publicity for writings or research which point to serious adverse

consequences. The writings are there, the research papers by eminent scientists are there, the books are there—but very few people know about them. One witness who will appear before the subcommittee will testify that in campus bookstores in the United States, Canada, and England, virtually all of the literature he found on marihuana—and he found a lot of it—took a tolerant attitude toward it or even advocated legalization.

It is because of this strange imbalance in dealing with the question of marihuana that most intelligent people are under the impression that the bulk of the scientific community looks upon marihuana as a relatively innocuous drug. Part of the purpose of the forthcoming hearings will be to inquire into, and document, the extent of the imbalance. In doing this, we shall, in effect, be presenting the "other side", so that the Senate and the American people will have a better understanding of both sides of this controversy.

In this morning's hearing our witnesses will present an overview of the cannabis epidemic from the time of the 1964 Berkeley uprising, which marked the beginning of the campus epidemic, to the present day. Our witnesses this morning are Dr. Harvey Powelson of the University of California; Dr. Henry Brill of Pilgrim State Hospital in New York; Mr. Andrew C. Tartaglino of the Drug Enforcement Administration; Maj. Gen. Frank B. Clay of the Department of Defense; and Dr. Donald Louria of the New Jersey Medical School.

Gentlemen, I want to thank you for taking the trouble to come before the subcommittee to testify on the subject of our inquiry. In the interest of saving time, I would like to ask that you all rise and be sworn simultaneously. If you would come forward, gentlemen.

Do you solemnly swear the testimony you are about to give will be the truth, the whole truth, and nothing but the truth, so help you God?

Dr. POWELSON. I do.

Dr. BRILL. I do.

Mr. TARTAGLINO. I do.

General CLAY. I do.

Dr. LOURIA. I do.

Senator EASTLAND. Mr. Tartaglino, will you come forward?

TESTIMONY OF ANDREW C. TARTAGLINO, ACTING DEPUTY ADMINISTRATOR, DRUG ENFORCEMENT ADMINISTRATION

Mr. MARTIN. Mr. Tartaglino, a few questions for the purpose of establishing your qualifications. You are Acting Deputy Administrator of the Drug Enforcement Administration?

Mr. TARTAGLINO. Yes, sir; I am.

Mr. MARTIN. You have held this position since July 1, 1973?

Mr. TARTAGLINO. That is correct, sir.

Mr. MARTIN. Prior to that you held a number of important positions in various agencies concerned with the enforcement of our drug laws?

Mr. TARTAGLINO. That is correct, sir.

Mr. MARTIN. Your first assignment in this field was with the Federal Bureau of Narcotics, in which you served as a criminal investigator from January 1963 to April 1966?

Mr. TARTAGLINO. That is correct, I served as criminal investigator.

Mr. MARTIN. That is not reflected in the biography which we were given. Then, you have been active in the field of enforcing our drug laws for more than 20 years?

Mr. TARTAGLINO. That is correct, sir.

Mr. MARTIN. Mr. Tartaglino, before you start your statement, will you tell us briefly what you mean by the words "hashish" and "cannabis", I think it would help people to have a clearer understanding of your testimony.

Mr. TARTAGLINO. It means all the preparations of the cannabis sativa plant of which there is but a single species. It includes the typical marihuana cigarette, hashish, marihuana or hashish oil, et cetera.

Mr. MARTIN. Marihuana and hashish are not basically different substances?

Mr. TARTAGLINO. That is correct, they come from the same plant. What I have brought with me this morning is an internal publication which sets out pretty much in detail what we mean when we are discussing broader terms. If you like, I will submit that for the record.

Mr. MARTIN. May that be admitted in the record, Mr. Chairman?

Senator EASTLAND. Yes.

[The document referred to may be found in the appendix, p. 418.]

Mr. MARTIN. Thank you, Mr. Tartaglino, you may proceed with your statement.

Mr. TARTAGLINO. Mr. Chairman and distinguished members of the subcommittee: My name is Andrew C. Tartaglino and I am the Acting Deputy Administrator for the Drug Enforcement Administration within the Department of Justice. Today I am appearing before you on behalf of Mr. John R. Bartels, Jr., our Administrator, who is presently out of the country on official travel. Appearing with me as counsel is Mr. Gene R. Haislip, also of DEA.

I am pleased to appear before your committee this morning in connection with its continuing inquiry into the illicit traffic in, and abuse of, marihuana. There is perhaps no more controversial subject in the area of drug control.

Marihuana has become the focus of an organized campaign designed to make its use a legally sanctioned and permanent feature of our society. Persons who take this position are fond of citing the emotional propaganda of the 1930's which referred to it as the "killer weed". But anyone familiar with the pro-marihuana literature of the present can see that they have indulged in equally exaggerated misrepresentations in the opposite direction. I believe that some of the data I have to present today will show that their point of view is equally out of date.

The details of the medical and scientific facts concerning marihuana abuse are matters which I prefer to leave to the doctors and scientists whom you have invited to appear before you today. My own view is that it is a potentially harmful substance which we should not permit to become an accepted part of our society. Those of us in law enforcement have felt that the dangers inherent in this drug would become more apparent with increasing research; and we believe this is in fact now occurring. The earlier views of some observers in the 1960's were based on examination of short-term users of marihuana of a relatively low potency. Concern has increased now that scientific investigators have been able to study the the effects of chronic use.

A major factor encouraging this conservative point of view is the steady trend toward the abuse of more potent marihuana preparations such as hashish and hashish oil. This trend can be seen in the figures attached to my statement which show that seizures of hashish have increased by 2,274 percent during the last 5 years to a total of almost 27 tons for calendar year 1973. Incidentally, when Mr. Bartels, our Administrator, testified before your committee in October of last year, the hashish seizures for the first half of 1973 were below the rate of the previous year. Now that figures for 1973 are complete, they exceed the previous year by 12 tons.

The mission of the Drug Enforcement Administration, however, is the suppression of the traffic in marihuana products and not their use which is primarily a problem for the Nation's health and educational authorities. While most of the drug law enforcement effort is conducted at the State and local level, the Federal Government through the DEA is uniquely suited to fulfill a broader mission—that of disrupting marihuana and hashish traffic which is organized at the interstate and international levels. To this end, our enforcement effort is focused on stopping the flow of the drug at, or near, its foreign source and in disrupting commerce in marihuana at its highest level where the apprehension of violators can have the most impact. We have found that the closer the point of interdiction is to the source of the drug, the greater is the quantity handled by a decreasing number of people. This is the target at which we aim in order to achieve optimum results.

The traditional source of marihuana reaching the United States is Mexico. It is illegally cultivated for this purpose on "marihuana plantations" in remote areas where little control is exercised by the central government. After harvesting and packaging, it may then move into the United States concealed in the normal stream of commerce, or by clandestine means utilizing aircraft, vessels, four-wheel drive vehicles, or body-packs.

Beginning with 1970, substantial quantities also began to arrive from Jamaica which has now become another principal source of supply. Lesser amounts are now being smuggled from Colombia as well, and hashish may originate from any one of several Middle and Far-Eastern countries, principally Morocco, Lebanon, Afghanistan, and Nepal.

There has been as much misrepresentation of the nature of the traffic in marihuana as there has been regarding the drug itself. Many have the impression that this traffic is somehow unlike that involving other drugs; that it is conducted more informally by students and young persons for reasons other than profit. This is no more the case today than it is with heroin or other contraband.

The traffic in marihuana is often a highly organized, well financed venture involving hundreds of thousands of dollars of illegal profits. The persons who engage in it are essentially the same criminal types who organize other forms of illicit drug traffic and have the same propensity for violence. For example, just last month, two uniformed U.S. Customs Patrol officers were found murdered near Nogales, Ariz., together with a suspect whom they had killed in a gun battle. This man was found seated at the wheel of a truck containing 200 pounds of marihuana which he had attempted to drive from the scene.

Perhaps one of the most extraordinary investigations illustrating the scope to which this marihuana traffic has grown is an investigation now in progress in Florida. This involves a group of successful professional and white collar financiers and their associates who refer to themselves as the "Gainesville Marihuana Dealers Association". The organization was first detected by the Florida Department of Law Enforcement. In November of last year, agents of our Miami regional headquarters joined with the State officers and U.S. Customs and Internal Revenue Service agents in a joint task force known as "Operation Panhandle".

Although the investigation is still in progress, enough has been learned to permit an estimate of their activities. During the 6 months in which the task force has been operating, this group has smuggled approximately 80 tons of marihuana into the United States. The drugs obtained through supply connections in Jamaica, and occasionally Colombia, and brought into predetermined landing points along the Florida panhandle by vessels carrying multiton loads. The drugs will then be convoyed by as many as 10 to 15 trucks in a single shipment to special storage areas on horse farms or orange groves owned by the association members. During deliveries, countersurveillance teams are established by the violators in watchtowers along the approaches to the storage areas. Later, the marihuana will be delivered by trucks, carrying one to several tons, to various association customers in any of the 32 affected States.

Thus far, the investigation has resulted in the arrest of 19 individuals, the seizure of 35 tons of marihuana and the seizure or impoundment of $1,250,000 of association funds. A brief description of several other representative cases is attached to my statement. In one of these a 153-foot 45-ton freighter was used in an attempt to smuggle 3,700 pounds of hashish from Morocco.

In spite of the fact that cases of this size and complexity have become common, large segments of the public persist in the view that trafficking in marihuana is a small affair indulged in by juve-

niles. One result of this is that sentences meted out to large-scale marihuana traffickers are frequently inadequate.

During the fall of last year, a special conspiracy unit comprised of Federal, State, and local officers was formed to investigate the activities of a suspect named Martin Williard Houlton, believed to be engaged in large-scale marihuana smuggling. When the investigation was finally completed, the intelligence indicated that Houlton, a 54-year-old proprietor of a Columbus, N. Mex. motel and bar, maintained a small air force of 20 high-speed aircraft which averaged 18 smuggling trips per week between Mexico and the United States. On each occasion, some 500 to 700 pounds of marihuana would be brought into the United States for distribution.

After obtaining advanced court authorization for a wire intercept information was at last obtained of the plans for a specific smuggling flight. On the day in question, a DEA agent conducting aerial surveillance from a DEA aircraft was able to monitor the takeoff of three of Houlton's aircraft, which were later observed to land and load suspected contraband. Aerial surveillance was maintained on the returning flight by DEA and U.S. Customs aircraft and shortly after the planes landed on a small airstrip near Columbus, Houlton and several of his associates were arrested in possession of 2,300 pounds of marihuana.

In February of this year, Houlton was found guilty by a New Mexico State court and given an 18-month suspended sentence and a $1,000 fine. Neither he nor any of his associates who were convicted with him, have served any time in prison for their extensive crimes.

The inescapable conclusion which we draw from the examples and statistics which I have cited is that the traffic in, and abuse of marihuana products has taken a more serious turn in the last 2 or 3 years than either the courts, the news media, or the public is aware. The shift is clearly toward the abuse of stronger, more dangerous forms of the drug which renders much of what has been said in the 1960's about the harmlessness of its use obsolete.

During the same period, the organization of the marihuana traffic has likewise increased in both size and complexity. Thus, the way in which the public, the judiciary, and oftentimes the law enforcement community, conceives of the marihuana problem is out of date, and our responses to it are similarly inappropriate. The purpose which I hope to serve in appearing before you this morning is to help bring about an awareness of this change.

Thank you, Mr. Chairman, I will now be pleased to respond to any questions which you or other committee members may have.

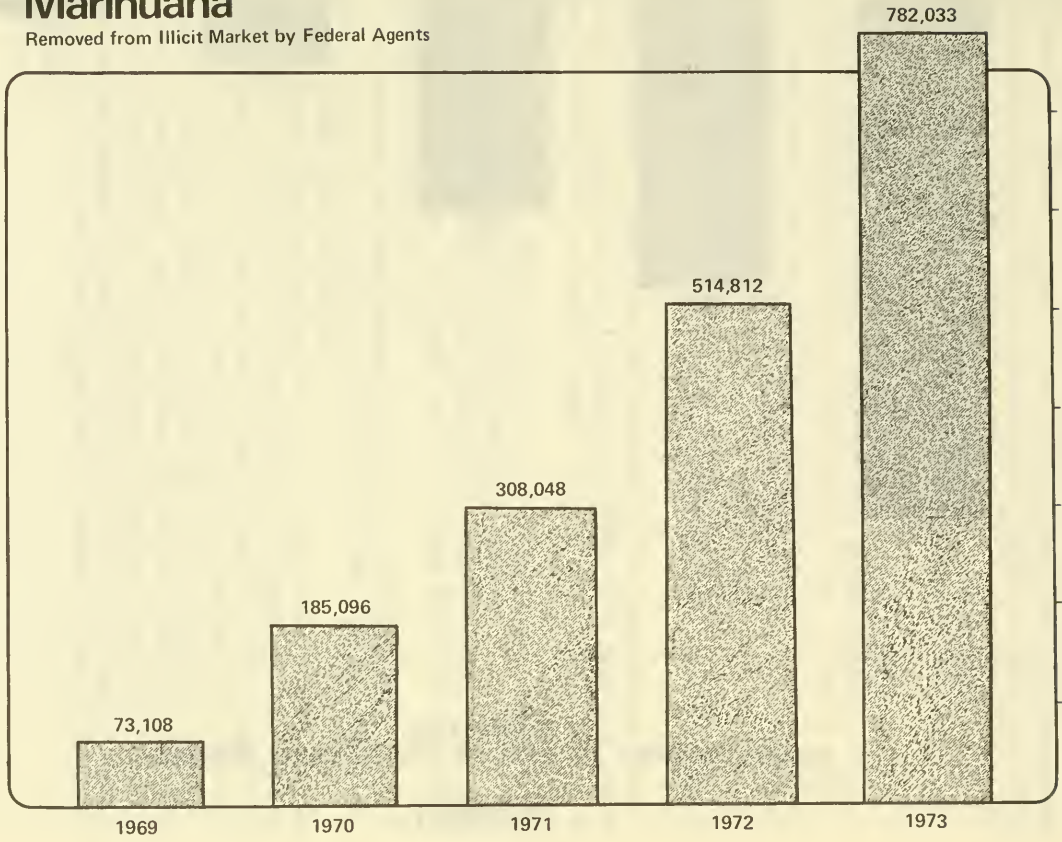
Mr. MARTIN. There are a number of charts and tables attached to the statement, Mr. Chairman; may the charts be incorporated into the record?

Senator EASTLAND. Yes.

Mr. MARTIN. Mr. Tartaglino, you have prepared a number of charts you wish to show the members of the committee; would you want to run through them quickly?

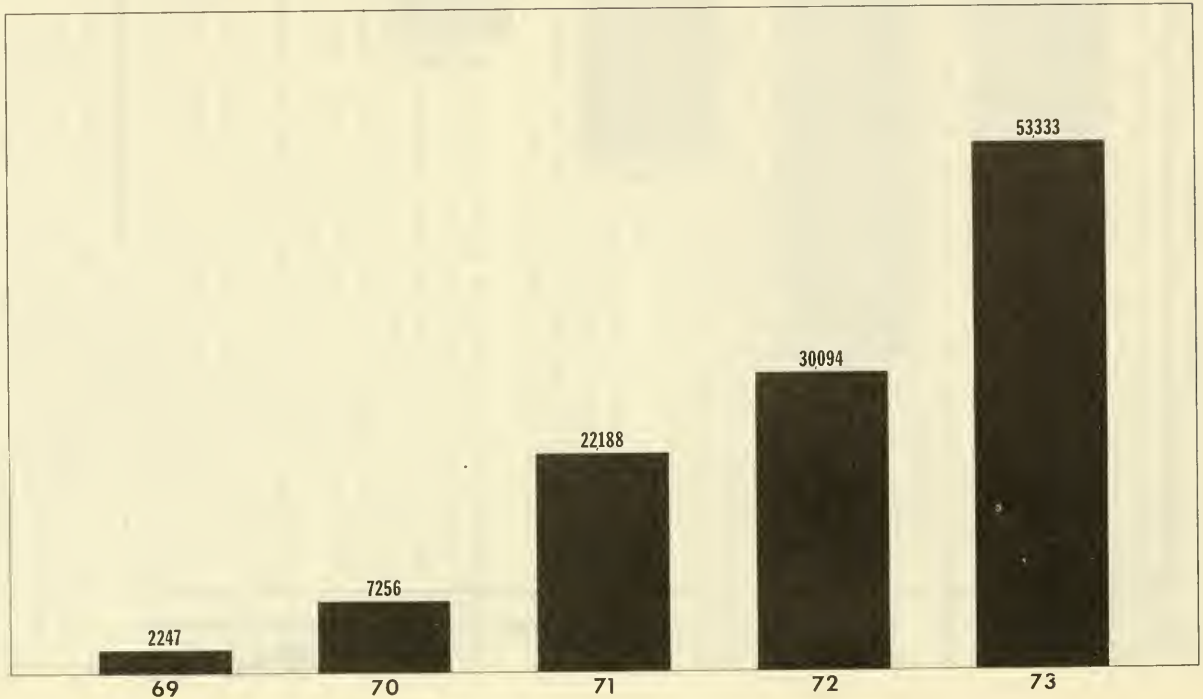
Marihuana

Removed from Illicit Market by Federal Agents



HASHISH

REMOVED FROM ILLICIT MARKET BY FEDERAL AGENTS
(IN POUNDS)



Mr. TARTAGLINO. The first chart illustrates the illicit marihuana and the second chart the illicit hashish by year from 1969 to 1973, removed by Federal agents alone. You can see that when we speak of hashish, seizures have increased from roughly a little more than 2,000 pounds in 1969 to 53,000 pounds in 1973, or some 27 tons. We have gone from 1 to 27 tons in a very short space of time.

In marihuana you can see a very similar increase. We have gone to some 375 tons that were removed in 1973.

Mr. MARTIN. 780,000 pounds?

Mr. TARTAGLINO. Yes, I am reducing that figure to tons; and that is just an illustration of how we have grown from 35 tons in 1969.

I might add that as recently as 10 years ago, the only hashish that was found in the United States was probably a quarter pound in the sole of some seaman's shoe that he brought over for his own use. I recall when our seizure was under 10 pounds a year. But, in 1969 we exceeded 1 ton, and of course last year we have gone to 27 tons.

Mr. MARTIN. I think it might be useful to let people know what 1 pound of hashish can do. A quart of whiskey can only get a few people drunk, but how many people can get drunk on a pound of hashish?

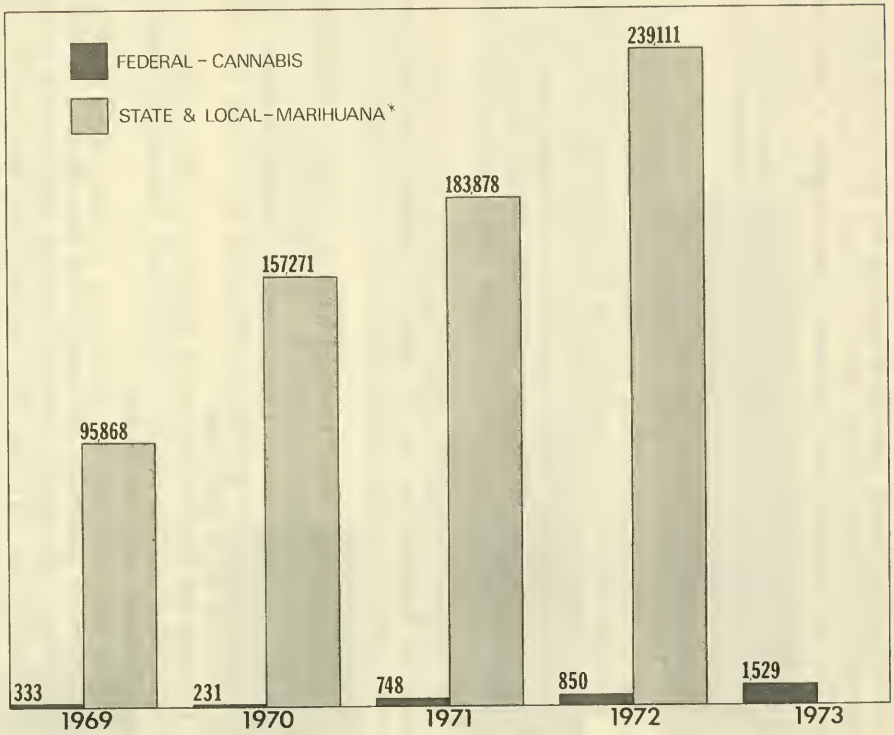
Mr. TARTAGLINO. Well, I would have to go into a discussion of the potency of it, but what you say is roughly correct.

This third chart shows the arrests for cannabis State, local and Federal; the yellow is Federal, we have gone from 333 arrests in 1969 to over 1,500 last year.

You can see local enforcement agencies in 1972 arrested almost a quarter of a million people in the United States for cannabis violations, hashish and marihuana.

In the map that you see before you we have tried to give you an illustration of generally the areas that are affected in the United States today; the purple arrows illustrate hashish; the orange illustrates marihuana. We also have represented there on this chart the largest marihuana seizure on record, 42 tons in Jamaica; a single seizure of marihuana which was destined for the United States. The largest domestic seizure last December, 20 tons in Florida. In hashish the largest domestic seizure, 3,700 pounds, almost 2 tons, in Miami, in March of this year. The largest foreign seizure, 12 tons in Karachi, Pakistan.

ARRESTS



* Source: Uniform Crime Report

Germany
France
Italy
Yugoslavia
Bulgaria
Spain
LEBANON
MOROCCO
AFGHANISTAN
PAKISTAN
INDIA
NEPAL
SOURCE COUNTRIES
Montreal
REPORTED MANUFACTURING
LARGEST SEIZURES
Hashish Domestic
3700 lbs
SS Sea Trader
Miami Mar. 1974
Hashish Foreign
12 tons
Karachi Nov. 1973
LARGEST MARIJUANA SEIZURES.
Foreign
42 tons
Jamaica July 1973
Domestic
20 tons
Mexico Beach, Florida
23 Dec. 1973

Senator EASTLAND. What is the difference between marihuana and hashish?

Mr. TARTAGLINO. Hashish is derived from the resin of the marihuana plant; it is a more concentrated form of marihuana.

Mr. MARTIN. What is the difference in strength?

Mr. TARTAGLINO. It has a great deal more potency. We measure marihuana preparations by their tetrahydrocannabinol content. Regular manicured marihuana has 1 to 2 percent tetrahydrocannabinol; hashish has 10 to 15 percent. So, it has perhaps seven times the strength.

Senator THURMOND. Several times the strength?

Mr. TARTAGLINO. Seven times the strength.

Senator THURMOND. Seven times the strength.

Mr. TARTAGLINO. Yes, as a general rule.

Mr. MARTIN. And then when it comes to liquid hashish, I believe Mr. Bartels has testified that you have samples going up to 90 percent THC content?

Mr. TARTAGLINO. That is correct, we have samples running all the way from 35 to 40 percent THC contents; and it is possible to make it up to 90 percent. That is relatively new on the market and certainly a most dangerous form.

Mr. MARTIN. I believe Mr. Bartels also testified that a drop of this on a cigarette is enough to send one off into the stratosphere—that is, 90 percent THC?

Mr. TARTAGLINO. That is correct, that is the maximum content.

Mr. MARTIN. I have a few questions—and I would like to suggest Mr. Chairman, that the charts and maps they have prepared, or photographs of them, be received for the record.

Senator EASTLAND. As exhibits, yes.

Mr. MARTIN. Thank you very much for your testimony, Mr. Tartaglino. When Mr. Bartels, your Administrator, was here, he was testifying on the Brotherhood of Eternal Love; that is an organization founded by Dr. Timothy Leary; is that correct?

Mr. TARTAGLINO. That is correct, sir.

Mr. MARTIN. Do you remember off-hand how many tons of hashish the Brotherhood was able to smuggle into the United States before you were able to close down on them?

Mr. TARTAGLINO. We will have to check our statistics, it was in excess of 20 tons.

Senator THURMOND. How much?

Mr. TARTAGLINO. In excess of 20 tons.

Mr. MARTIN. 40,000 pounds.

Mr. TARTAGLINO. Yes, sir.

Mr. MARTIN. From Mr. Bartels' previous testimony, and from your testimony today it is apparent that over the past few years smugglers have been operating with much more massive quantities of marihuana and hashish?

Mr. TARTAGLINO. That is correct, a shift of such massive quantities that they are going from aircraft to ships, which is a major change.

Mr. MARTIN. Now, the figures in the charts you have shown us reflect only the quantities interdicted by the Federal law enforce-

ment; they do not reflect the quantities seized by local and State law enforcement authorities?

Mr. TARTAGLINO. They reflect the quantities seized by Federal law enforcement authorities in cooperation with foreign authorities where we have liaison or offices abroad; they do not include local seizures.

Mr. MARTIN. If you included local seizures, the total quantities removed from the illicit market would be substantially higher for marihuana and hashish than the figures we have in the charts?

Mr. TARTAGLINO. Absolutely.

Mr. MARTIN. Now, I have here a few items dealing with massive seizures of cannabis in recent weeks, in Puerto Rico and Mexico. On March 23 San Juan reported a seizure of some 700 pounds of marihuana coming from Colombia; and there is a second item from San Juan, dated March 28, which speaks about the seizure of almost 8,000 pounds of marihuana, $10 million worth. Do you have a record of either of these seizures?

Mr. TARTAGLINO. We would have a record of it, but I don't have it with me here, sir.

Mr. MARTIN. But you would not have a record of seizures made by local authorities?

Mr. TARTAGLINO. If they were made by local authorities, we may just have a newspaper item we collect for routine information. But if it was a local authority, we would not have that in our statistics.

Mr. MARTIN. And I would simply note for the record that the third item, dated Acapulco, March 30—these items all fall within a week—reports a seizure of 6½ tons of marihuana, 13,000 pounds, by the Mexican police. That's a big chunk of marihuana.

Is there any doubt in your mind that the United States was the target area for this massive seizure of marihuana in Acapulco?

Mr. TARTAGLINO. There is no doubt in my mind. We can reasonably suppose that most of the large seizures are traditional traffic to the United States.

Senator THURMOND. Mr. Chairman, I want to commend you for arranging these hearings; and I want to express my appreciation to the witnesses who are appearing here, too; I believe we have hearings set for the 16th and 17th, and I hope I can attend these hearings. Today I'm tied up in the Armed Services and we scheduled $9 billion for our Armed Forces; I ask the chairman to excuse me for that reason. But, I did want to come by and show my interest in these hearings, they are extremely important. I am scheduled to chair these hearings on the 20th, and I am looking forward to that time, too. I don't know of any subject more important, especially affecting our young people than this question of drugs.

Mr. MARTIN. I have a few questions I would like to ask you, Mr. Tartaglino, about your chart dealing with the increase in cannabis-related arrests. The chart shows far fewer arrests by the Federal authorities than by the local authorities. Would this be because the Federal authorities concentrate on the large-scale smuggling operators, while most of the arrests made by local authorities have to do with small-scale possession?

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Mr. TARTAGLINO. We had a criteria that we utilized, and we set our sights at large-scale interstate traffic, and international traffic. We do that in coordination with local and State authorities. So, your answer is correct, sir.

Mr. MARTIN. Now, in terms of the actual quantities of cannabis seized or interdicted, the Federal authorities probably seized far more from the illicit market than the local authorities?

Mr. TARTAGLINO. Yes, sir.

Mr. MARTIN. Is it true that the local law enforcement authorities in most parts of the country are less rigorous than they used to be in arresting young people who have a joint or two of marihuana in their possession; do you have any impression on that?

Mr. TARTAGLINO. I don't believe I could accurately answer that question.

Mr. MARTIN. Right. Would it be reasonable to infer that the tremendous increase in cannabis arrests by State and local authorities, tied in with the figures in your own charts, points to a sharp increase in marihuana and hashish consumption in our country?

Mr. TARTAGLINO. There is no question about that.

Mr. MARTIN. Could this increase in cannabis interdictions portrayed in your charts be the result, at least in part, of improved enforcement capabilities?

Mr. TARTAGLINO. I think we can say that there is increased awareness by local, State, and Federal enforcement, of the dangers.

Mr. MARTIN. Do you have more men?

Mr. TARTAGLINO. We have more men than we had 4, or 5 years ago.

Mr. MARTIN. Better technology?

Mr. TARTAGLINO. Better technology; we have more individuals involved in this war; we have better State-Federal programs in metropolitan enforcement groups throughout the United States; task forces, local, State, and Federal.

Mr. MARTIN. But you don't believe that the tremendous increase can be explained entirely on the basis of improved enforcement capability?

Mr. TARTAGLINO. Absolutely not.

Mr. MARTIN. I note in table No. 6 attached to your statement that interdiction of heroin went down from 1,541 pounds in 1971 to just over 1,000 pounds in 1972, and 483 pounds in 1973. This isn't because you slackened your efforts against heroin?

Mr. TARTAGLINO. No, we feel that we have made some inroads in the heroin traffic. I think that the seizures that have been made, and the recent reduction in seizures reflect a decrease in the traffic. I will have to develop this more. I think it is directly related to a lot of cooperation overseas, better groups in the United States working on it, increased manpower, increased resources, et cetera. We are in our 26th, or 28th month of what we refer to cautiously as a heroin shortage. There definitely is a heroin shortage in the United States.

Mr. MARTIN. Generally speaking, the reduction in the amount of heroin interdiction more or less corresponds to what we know about the decrease in actual heroin use in this country?

Mr. TARTAGLINO. That is correct.

Mr. MARTIN. And the next question is, wouldn't this reinforce

the assumption that the tremendous increase in the interdiction of marihuana and hashish does in fact correspond to the amount actually consumed?

Mr. TARTAGLINO. I think our understanding is that the increased seizures mean that there is a lot more coming in, yes.

Mr. MARTIN. Right. Those are the only questions I have.

Mr. SOURWINE. You have three attachments covering specific cases, I think they should go in the record, Mr. Chairman.

Senator EASTLAND. The attachments will be received for the record.

[The material referred to follows:]

HASHISH SMUGGLING: EAST COAST SURVEILLANCE

On March 1, 1973, the Air Police at Orly Airport, Paris, France advised DEA that two individuals had been observed carrying $297,000 in American currency. An investigation had been initiated on Donald and John Griffin who arrived in the United States from France in December 1972 and who were planning to return to Europe via the SS Michelangelo accompanied by four automobiles. Further investigation identified these individuals as being active in the Miami, Florida area where they had purchased two luxury imported automobiles, a Maserati and a Lamborghini for $33,850. Both vehicles were paid for in five and ten dollar bills taken from a clear plastic bag issued by a national hotel chain. The subjects' motel was located and it was ascertained that they and other accomplices had rented a 30 ft. sailboat at North Palm Beach, Florida subsequently returning that boat for a larger vessel. Nine months later the same group attempted to rent another sailboat but were discouraged by the company's inquiries as to their purpose in renting. Alerted by the Marine Company, DEA located the two subjects registered at a Juno Beach, Florida motel under assumed names. DEA surveillance established that the two subjects were subsequently joined by two additional subjects. Three of the subjects rented a 22 ft. motor home and spent two days driving through Northern Florida and Southern Georgia. DEA vehicle and aerial surveillance was maintained and they were observed examining the Atlantic Coast and the St. Johns River while using navigational charts.

Upon returning in the motor home the subjects conducted numerous forays out of their two motels using the motor home and a rented automobile. Using the auto, two subjects visited a boat yard and then proceeded to a wooded section adjoining the inter-coastal waterway where they remained in the woods for a brief period and then joined their cohorts in the motor home several miles away. Later the same day all four subjects revisited the wooded site and subsequently two of them went to the boat yard they had visited earlier and were observed proceeding south in the inter-coastal waterway in an 18-ft. motorboat. At midnight the motorboat was observed returning toward the boat yard with its running lights off. The motor home was surveilled with the four subjects as it drove to the wooded site along the inter-coastal waterway where it parked for a short while then proceeded to Ft. Pierce, Florida for the night. The following day the motor home was driven to Palm Beach Gardens, Florida where the four subjects registered at a motel and were soon joined by a fifth conspirator and subsequently by a sixth conspirator, a known narcotic violator from New York. The mobile home and three subjects proceeded to Jacksonville, Florida later in the day and registered at a motel where they were joined by the other three subjects who drove in a rented automobile. The rented car was then exchanged for another vehicle.

The following day the New York violator departed for New York via commercial aircraft and for the next two days DEA agents maintained aerial and vehicle surveillance on the five subjects as they proceeded north. During the course of the surveillance, agents seized traces of hashish from one of their recently vacated motel rooms. During the evening of October 29th through October 30th the subjects were under constant surveillance as they operated out of their Annapolis, Maryland motel. They placed foreign tele-

phone calls and recontacted the New York City narcotic violator and also telephoned a local resident. The rented auto was spotted from the air at a local farmhouse which had been telephoned earlier. The subjects attempted counter-surveillance techniques as the car and motor home established contact and moved to the farmhouse area. When the motor home stopped to let traffic pass, surveilling agents arrested the three occupants. The interior of the motor home was pungent with the odor of marihuana substance and 1183 lbs. of hashish and 46 lbs. of hashish oil were seized. DEA agents then drove the motor home to the farmhouse where they were greeted by four additional individuals and two of the subjects who were unaware of the fact that occupants of the motor home were federal agents. Arrests were made and an automatic weapon, additional hashish and marihuana, and two Citizen's Band radios were seized.

Follow-up investigation established a smuggling conspiracy involving citizens of the United States, England, Australia, and South Africa who controlled a fleet of yachts operating out of France and Spain via Lebanon to the United States. It was established that over 3,000 lbs. of hashish had been smuggled into the United States by this ring on four occasions. Five subjects, in addition to the eight arrested, have been identified and are under active investigation at this time.

Hashish Smuggling From Pakistan

In November 1973, a confidential informant reported to DEA agents at Karachi, Pakistan, that an individual, later identified as Mohammed Sultan, had approached him seeking assistance in locating someone who would smuggle one to two tons of hashish into the United States. Following instructions of the DEA agents, the informant told Sultan that he knew a U.S. diplomat who was being transferred back to the U.S. and would probably be willing to send the hashish with his personal effects.

On November 6, 1973 a DEA agent was introduced to Sultan as being the diplomat. Sultan accepted the agent and stated that he wished to ship 1,000 kilograms of hashish. Sultan expected the deal to bring a profit of $1,000,000 of which Sultan was to get half, with $400,000 going to the Agent and $100,000 to the informant. The agent said he would be flying to the U.S. in a day or two after packing his household effects. Sultan then said the agent could make an additional $40,000 by taking 100 kilograms with him on the aircraft.

On November 8, 1973, Sultan gave the agent $500 advance toward expenses. At this same meeting Sultan asked if the agent could take 150 kilograms of hashish on the plane instead of 100 kilograms, explaining that someone would meet the agent in New York and pay him $60,000 for the hashish. The agent accepted.

On November 15, 1973, Sultan introduced the agent to his partner Makil Ashraf and to Salim Hraoui who was to be the recipient in New York. On November 18, 1973, the agent again met with Sultan, Ashraf, and Hraoui and arrangements were made for delivery of two tons of hashish to the American Consulate, ostensibly for inclusion with the agent's household effects. Later the same day Sultan called the agent and said he was unable to locate a truck. The agent then obtained a Consulate truck and drove it, as instructed by Sultan, to the Pakistan Textile Plant at Karachi, where it was loaded with two tons of hashish. This same date, Sultan delivered to the agent $2,500 additional expense money. The hashish was subsequently turned over to Pakistan Sea Customs.

On November 19, 1973, the agent proceeded to the Pakistan Textile Factory at Sultan's instruction, and picked up seven suitcases containing 151 kilograms of hashish. The agent retained a representative sample of approximately seven kilograms, for delivery to New York, and turned the balance over to Pakistan Sea Customs.

On November 20, 1973, the agent arrived in New York and met Salim Hraoui. When the agent told Hraoui the hashish was ready for delivery Hraoui paid the agent $35,000. Hraoui was arrested as he went to a vehicle to obtain the hashish.

On the night of November 22, 1973, Mohammed Sultan was arrested in Karachi. He subsequently admitted that he had an additional quantity of about 10 tons of hashish concealed in 55 gallon drums at the Pakistan Textile

Factory. DEA agents and Pakistan Customs officers went to the factory, found and seized the 10 tons of hashish.

This operation removed over 12 tons of hashish from the market and resulted in the arrest of the principal defendants. Prosecution is pending as of April 29, 1974.

"Sea Trader"

During February 1974, information was developed which indicated that a group of individuals had been smuggling tons of marihuana from the Caribbean into the United States, including New York, Louisiana, and Florida. Information was also developed that this group had been planning to bring a large load of hashish from Morocco. Intelligence indicated that the load would be 7,000 pounds and would be transported on a vessel later identified as the "Sea Trader." The "Sea Trader" is a 153 foot, 45 ton gross freighter, registered out of Panama. The "Sea Trader" was believed to be in Morocco, departure date unknown, and attempts to locate were initiated, and alerts were posted in the continental United States.

On April 9, 1974, information was received that the "Sea Trader" was dead in the water with engine trouble at a point approximately 150 miles south-east of Bermuda.

DEA requested the assistance of the U.S. Coast Guard who dispatched a long range search plane to locate "Sea Trader" and conduct a search for any vessel enroute to contact "Sea Trader" and attempt to offload the hashish.

The U.S. Coast Guard Cutter "Gallatin" was dispatched and proceeded at the fastest possible speed to attempt to take the vessel in tow to the nearest U.S. Port.

On April 10, 1974, Coast Guard Cutter "Gallatin" arrived on scene and relieved sea going Tug Robin VIII of the tow. "Sea Trader" would not agree to be towed to the nearest U.S. port but agreed to have "Gallatin" tow "Sea Trader" to protected Bahamian waters.

On April 12, 1974, "Sea Trader" was anchored within the 3-mile limit of Bahamian waters and two other boats approached to assist the "Sea Trader."

"Sea Trader" was boarded by Drug Enforcement Administration and Bahamian authorities and subsequent search revealed 70 bags containing approximately 3,700 pounds of hashish. Nine subjects were arrested and two vessels were seized by the Bahamian authorities.

The contraband and subjects were returned to Nassau for criminal proceedings. DEA will initiate conspiracy indictments in the United States.

Mr. Sourwine. Your charts and tables, sir, appear to indicate that the rate of increase of hashish is substantially greater than the rate of increase of marihuana. For instance, over a 5-year period the marihuana increase is roughly 10 times; the hashish increase is 22 times. Do you take that as an indication that hashish is in some degree replacing marihuana, that the user is starting out with pot and graduating to hash?

MARIHUANA AND HASHISH REMOVED FROM ILLICIT MARKET BY FEDERAL AGENTS (IN POUNDS)

	Calendar year—				
	1969	1970	1971	1972	1973
Marihuana:					
Total	73,108	185,096	308,048	514,812	782,033
Domestic (DEA)	9,924	9,092	21,380	51,897	51,379
Ports and borders (Customs, INS)	59,840	148,772	201,558	365,421	489,961
DEA/foreign cooperative	3,344	26,422	85,110	97,494	240,693
Hashish:					
Total	2,247	7,256	22,188	30,094	53,333
Domestic (DEA)	239	234	882	1,151	641
Ports and borders (Customs, INS)	1,602	3,811	6,900	8,754	7,235
DEA/foreign cooperative	406	3,211	14,406	20,189	45,457

OPIUM, HEROIN, AND COCAINE REMOVAL FROM ILLICIT MARKET BY FEDERAL AGENTS AND ARRESTS

	Calendar year—				
	1969	1970	1971	1972	1973
Total domestic removal (in pounds):					
Opium	25	30	58	66	120
Heroin	427	691	1,541	1,036	483
Cocaine	208	730	602	916	1,347
Total DEA/foreign cooperative seizures (in pounds):					
Opium	1,590	1,360	1,440	17,379	50,746
Morphine base	706	811	2,271	2,104	2,262
Heroin	395	301	937	2,416	821
Cocaine	35	75	346	801	1,015
DEA Federal arrests:					
Heroin				2,159	2,169
Cocaine	[1] 950	[1] 1,104	[1] 1,923	1,231	1,645
Other narcotics				63	47
State and local arrests: [2]					
Heroin and cocaine	67,945	108,427	114,573	92,364	

[1] Reported as narcotics arrests.
[2] Source: Uniform crime report.

QUANTITIES OF DRUGS SEIZED [1]

[In kilograms] [1]

	Calendar year—		
	1968	1969	1970
Cannabis:			
Herb	1,471,408	1,825,769	3,073,638
Resin	37,253	32,237	41,574
Opium	40,153	40,729	29,308
Morphine	813	846	543
Heroin	546	463	567
Cocaine	158	152	460

[1] Source: 25th Session, Commission on Narcotic Drugs (Sept. 22, 1972).

Mr. TARTAGLINO. I definitely think so, I agree with that.
Mr. MARTIN. Thank you very much, Mr. Tartaglino.
Mr. TARTAGLINO. Thank you, sir.
Mr. MARTIN. Dr. Harvey Powelson will be our next witness.
Senator EASTLAND. Identify yourself for the record, sir.

TESTIMONY OF DR. HARVEY POWELSON, UNIVERSITY OF CALIFORNIA AT BERKELEY

Dr. POWELSON. I am Dr. Harvey Powelson, from the University of California at Berkeley. I want to thank the chairman and the committee for having me here today, I am honored and pleased.

Mr. MARTIN. Before you read your statement, Dr. Powelson, I would like to ask you a few questions for the purpose of establishing your qualifications. Now, you have a degree in medicine and a degree in psychiatry from the University of California?

Dr. POWELSON. That's right.

Mr. MARTIN. You have been a practicing psychiatrist since 1951?

Dr. POWELSON. That's correct.

Mr. MARTIN. You held a clinical appointment on the faculty of

the University of California Medical School until you resigned from the faculty last year?

Dr. POWELSON. That's correct.

Mr. MARTIN. You have also served on the faculty of the Psychoanalytic Institute in San Francisco?

Dr. POWELSON. That's right.

Mr. MARTIN. You served as director of the psychiatric department of Kaiser Hospital in Oakland, Calif., for 8 years?

Dr. POWELSON. That's correct.

Mr. MARTIN. You are currently serving as a research psychiatrist at the University of California at Berkeley?

Dr. POWELSON. Yes, sir.

Mr. MARTIN. You are also currently serving as mental health officer of Calaveras County?

Dr. POWELSON. Yes.

Mr. MARTIN. You served from 1964 to 1972 as director of the psychiatric department of the Student Health Service at the University of California at Berkeley?

Dr. POWELSON. That's correct.

Mr. MARTIN. All right, Dr. Powelson, will you proceed with your prepared statement. The mike is not working too well, so, if you would keep your voice level up it would be helpful.

Dr. POWELSON. In 1965, I was chief of the Department of Psychiatry in the Student Health Service at the University of California in Berkeley. It was the first year of the student riots. It was also the first year that hallucinogens were becoming widely used and I, as the person responsible for mental health on that campus, was vigorously involved in the debate about psilocibin, LSD, and mescaline.

In the spring of that year a reporter for the Daily Californian, the student newspaper, asked for my opinion on marihuana. At that time I lacked any direct experience as a physician with marihuana users. The medical literature was sparse, but in general seemed to be saying that there was no proof of long term harmful effects from marihuana. I summarized this for the reporter and said there was no proof of harm and that it probably should be legalized and controlled. In general, this view met with approval from most of the students and most of my professional colleagues.

In 1965, the use of marihuana spread throughout the Berkeley campus. Simultaneously its use was spreading to all the colleges and universities across the country. From the campus communities it spread at an accelerating rate through the surrounding communities. By now its use is subject to no age, social or geographic barriers.

My place of observation was unique. I was there at the beginning and in my work I was actively involved with students not only as a psychiatrist but as a teacher, and as a participant in a 4-year research project studying maturation and growth, in college students. In addition, I was routinely meeting with deans and administrators who were dealing with the drug problem and the students

who were in academic and/or disciplinary difficulties as a consequence of the use of marihuana and its derivatives.

Most importantly, I was in daily contact with the constant flow of students through the student health service and the psychiatric clinic and hospital.

During the period I am speaking of, from 1965 to 1972, the clinic saw approximately 2,000 to 3,000 students a year as outpatients and about 150 to 200 students a year who were mentally ill enough to be hospitalized. Naturally, I didn't see all these students but the people who ministered to them were all under my supervision. I personally interviewed about 200 students a year; many were seen for a single hour, others were seen as intensively as 2 to 3 times a week for varying lengths of time up to and including 5 years.

During this time, from 1965 to 1972, an increasing number of patients were using marihuana. My best guess, based on surveys and impressions is that more than 90 percent used it at one time or another in college. More than 50 percent used it "socially", approximately 1 or 2 times a week; and about 10 percent were heavy users, at least 1 time daily.

My first important shift in thinking occurred as a result of observations made during psychotherapy with a young man, S., who was bright enough to be getting his law degree and Ph. D. simultaneously and competent enough to be learning to fly and deal in real estate at the same time. As we proceeded in our work together, I came to know S.'s way of thinking; how he thought. Most of us do this without thinking about it. All of us come to know to some degree the way our friends and colleagues think. In therapy, the opportunity to hear someone think out loud about a problem important to him maximizes the opportunity to come to know how he uses or misuses logic, remember clearly or not at all does or does not exercise good judgment about his own thinking and whether or not he is able to know his own feelings. We had made enough headway so that S. had begun to be able to observe and understand his own thinking. Periodically we had hours, I was seeing him twice weekly, when his thinking became mushy. If I tried to follow him, my head began to spin. When I protested that he'd become impossible to listen to, he would argue that his own experience was that he was thinking more clearly, more insightfully, than ever. On one such occasion, he mentioned that he had been to a party 2 nights before where he'd had particularly good "grass". In Berkeley, in 1968, that was not a particularly memorable remark, but we thought there might be some connection with his thinking. This same series of events occurred often enough so that I finally was able at times to post dict that S. had had some "mind-expanding drug", usually marihuana.

S., because he was a good observer, helped show me another aspect of the thinking disorder I'm describing. Central to his difficulties was a paranoid stance toward the world. By this I mean a style of thinking characterized by a constant suspicion that one is being

controlled, for example, by the establishment, the system, et cetera; and simultaneously a constant unwitting search for people and situations which will do just that; drugs, demagogues. If this manner of thinking is carried further, it blends into the condition usually called paranoia. Here the subject is controlled by voices, God, or whatever, and at the same time he is very often "against his will" being controlled by a State hospital or jail. S. was forever talking about his search for something or someone he could trust. He very frequently clutched to himself people who were totally untrustworthy and hurt and rejected others who manifestedly admired and liked him.

When he had used marihuana, his thinking became more paranoid, that is, he became more mistrustful of me, for instance, and at the same time he became more wily so that he talked glibly, using cliches, theories, and "insights", all to avoid noticing concretely and immediately whatever he was really doing and feeling in his relationship with me, as well as his relationships outside. In short, the pathological part of his thinking was exaggerated in two ways, he was more suspicious, et cetera, and he was more adept at fooling himself about what he was up to, while simultaneously maintaining how "aware", "in touch" and "loving" he was.

S. continued in therapy but also continued to use marihuana and hashish. Toward the end of his therapy, I had decided that so long as he muddled his thinking in this way, there was no use continuing. He, however, suffered a fatal accident—as a result of an error in judgment—before his therapy actually terminated.

As I was becoming familiar with these effects of marihuana on S., I gradually learned to pick up signs when they were more subtle. I came to observe the same changes in others, that is, that marihuana exacerbated the pathological aspects of their thinking.

These observations were made before controlled studies began to give us clues as to the nature of the mental changes taking place which could explain these phenomena. The committee has undoubtedly heard or will hear of the studies by the Hollister group at Stanford on what they call "temporal disintegration" which seem to be changes secondary to the loss of immediate memory and the loss of an accurate time sense. There are also corroborating studies from Utah, clinical studies by Kolansky and Moore, X-ray studies by Campbell in England, and a study on students by Schwarz at the University of British Columbia to cite a few of the most relevant studies made on subjects comparable to the ones I'm describing.

Following the above described observations, I saw the same picture more and more frequently. The essence of the pattern is that with small amounts of marihuana, approximately three joints of street grade, memory and time sense are interfered with. With regular usage the active principles cause more and more distorted thinking. The user's field of interest gets narrower and narrower as he focuses his attention on immediate sensation. At the same time his dependence and tolerance is growing. As he uses more of the

drug, his ability to think sequentially diminishes. Without his awareness, he becomes less and less adequate in areas where judgment, memory and logic are necessary. As this happens, he depends more and more on pathological patterns of thinking. Ultimately all heavy users, that is daily users, develop a paranoid way of thinking.

After I had become aware of the generality of this sequence another reporter from the Daily Californian interviewed me to see if my opinions had changed in the interim. In the course of that interview, I realized in a concrete and explicit way that they had. The headline read, "Psychiatrist says pot smokers can't think straight". This time the response of the community and colleagues was not so approving. It is an interesting fact that questioning the claims of marihuana users leads to much more anger, vilification, and character assassination than does the opposite stance.

In subsequent years in Berkeley, both at the clinic and in my private practice, I have observed the long-term effects of cannabis. Originally, my observation was that students who had "dropped out" into the "drug scene" and were attempting to return, were finding it difficult if not impossible. A frequent story is that the young person has become aware that the life he's been leading is unsatisfactory and unproductive. He then stops drugs for 6 months, or so, and reenters the university. When he returns to school, however, he finds that he can't think clearly and that, in ways he finds difficult to describe, he can't use his mind in the way he did before. Such people also seem to be aware that they have lost their will someplace, that to do something, to do anything, requires a gigantic effort—in short, they have become will-less, what we call anomic. An irony here is that they have now achieved the freedom they sought. They need an external director. They are ripe for a demagogue.

The changes in the capacity to think in some subjects are long lasting if not permanent. One of my original, 1967, subjects was a member of the junior faculty. He "dropped out" and used hashish exclusively for 18 months in daily doses. When he realized that it was interfering with his physical coordination he stopped all drugs. Two years subsequent to this he returned to the University. He found that he could not do mathematics at a level which he had found possible before; 3½ years later, his conviction was that the change was permanent. My own observations of him and other such gifted people have led me to the same conclusion, that is, that the damage may be permanent.

My stance toward marihuana has shifted to the extent that I now think it is the most dangerous drug we must contend with for the following reasons:

(1) Its early use is beguiling. It gives the illusion of feeling good. The user is not aware of the beginning loss of mental functioning. I have never seen an exception to the observation that marihuana impairs the user's ability to judge the loss of his own mental functioning.

(2) After 1 to 3 years of continuous use the ability to think has become so impaired that pathological forms of thinking begin to take over the entire thought process.

(3) Chronic heavy use leads to paranoid thinking.

(4) Chronic heavy use leads to deterioration in body and mental functioning which is difficult and perhaps impossible to reverse.

(5) For reasons which I can't elucidate here, its use leads to delusional system of thinking which has inherent in it the strong need to seduce and proselytize others. I have rarely seen a regular marihuana user who wasn't actively "pushing".

As these people move into government, the professions, and the media, it is not surprising that they continue as "pushers", thus continuously adding to the confusion that this committee is committed to ameliorate.

That's the end of my formal statement. I want to document just briefly the last statement as to the extent, with examples of the kind of avalanche, of propaganda——

Mr. MARTIN. One clarification, Dr. Powelson, when you talk about pushers, you don't mean people going out selling it in the street, you mean ideological pushers?

Dr. POWELSON. That is the reason I put quotes around it. I am talking about people who don't sell it, who are actively engaged in getting other people to use it, that is what I am describing. When they become active in government, or professions, and so on, the same thinking process continues, it now becomes an ideological type of pushing.

Mr. MARTIN. You mentioned several exhibits that you wish to offer for the record.

Dr. POWELSON. Yes; one of the most active groups is called NORML.

Mr. MARTIN. These are groups that call for what—the legalization of marihuana?

Dr. POWELSON. The NORML group, called the National Organization for the Reform of Marihuana Laws, they are pushing for legalization, as does the official handbook for marihuana users, "A Child's Garden of Grass". Let me read a few chapter headings; "The Effects of Grass", "Grass As an Aphrodisiac", "Games To Play While Stoned", "Acquiring Grass", "Using Grass", "Stashing Grass". They put out a series of stamps with the words "Liberate Marihuana". Also a shoulder patch, tote bag, and a constant stream of propaganda material.

Mr. MARTIN. That is the official insignia of the organization?

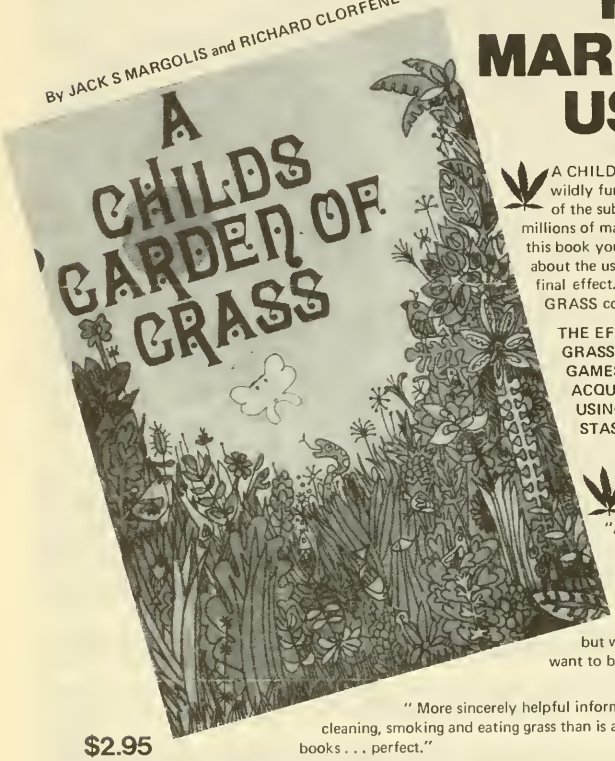
Dr. POWELSON. Yes, the insignia on the stamps, shoulder patch and tote bag.

Senator EASTLAND. The documents will be admitted.

[The documents referred to follow:]

THE OFFICIAL HANDBOOK FOR MARIJUANA USERS

By JACK S MARGOLIS and RICHARD CLORFENE



A CHILD'S GARDEN OF GRASS is a wildly funny examination of every aspect of the sub-culture which exists among the millions of marijuana users. When you finish this book you will know all there is to know about the use of the weed from first joint to final effect. A CHILD'S GARDEN OF GRASS covers:

THE EFFECTS OF GRASS
GRASS AS AN APHRODISIAC
GAMES TO PLAY WHILE STONED
ACQUIRING GRASS
USING GRASS
STASHING GRASS

"Books about drugs are surely in, especially those dealing with marijuana. None is more popular than "A Child's Garden of Grass."
Gene Shalit, NBC's Today television program.

"It has something to say to those who have, to those who haven't but want to, and even to those who don't want to but would like to stay informed."
TIME Magazine

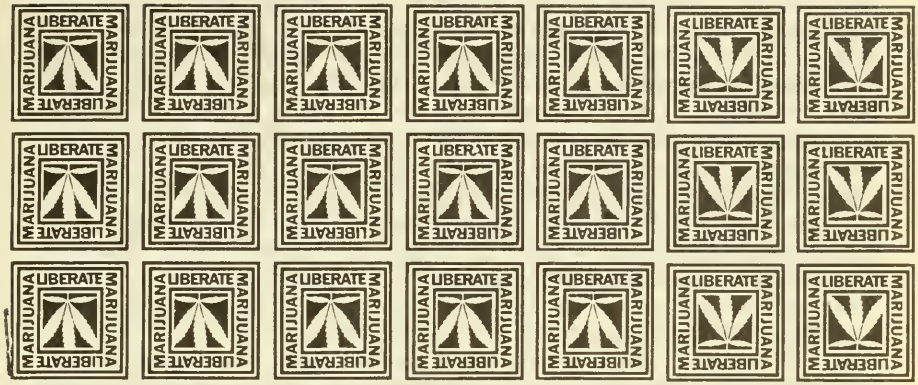
" More sincerely helpful information about buying, growing, cleaning, smoking and eating grass than is available in nearly all the other pot books . . . perfect."
Rolling Stone Magazine

$2.95

REVISED EDITION, CONTAINING ADDITIONAL AND UP-DATED MATERIAL

TOTE BAG SOLD BY NORML

(National Organization for Reform of the Marijuana Law)



Mr. MARTIN. Apart from NORML, are there any other organizations involved in the lobbying to legalize marihuana?

Dr. POWELSON. Yes, sir, in California there is a group called "Amphoria", they are openly coming out for the advancement of marihuana. Some of the pernicious ones to my mind are the ones that pose as educational organizations, for instance the National Coordinating Council on Drug Education. It puts out a newsletter called "National Drug Reporter". It labels itself a non-profit drug education consortium of 130 national, professional, law enforcement, government, youth and service organizations and corporations, a coordinated effort to find rational approaches to drug abuse prevention. I think anyone looking at the newsletter gets the message very clearly that that is not what it is doing. It is passing out information which is essentially what I would call pushing.

Mr. MARTIN. That is information in support of marihuana, or the legalization of marihuana, is that what you mean?

Dr. POWELSON. That is all through the text. For instance, the books that they suggest are all promarihuana. Here is an item that I picked up because I am familiar with the group and know what they are talking about, "Review of the National Committee on Marihuana", sponsored by Amphoria, produced by Ray Films, interviewed the noted drug authority John Captain, Dr. Davis—it's available from Ashbury Films, 707 Kirby Street, San Francisco.

I think it's not unfair to say this is a typical example——

Mr. MARTIN. Could you raise your voice a little, Dr. Powelson, when you talk?

The organization you mentioned is the National Council for Drug Abuse?

Dr. POWELSON. The National Coordinating Council for Drug Abuse Education.

Mr. MARTIN. Do you know who the officers of that organization are?

Dr. POWELSON. The president is Paul Perito, the vice president is Michael Sonnenreich.

Mr. MARTIN. Do you know who these gentlemen are?

Dr. POWELSON. The only one familiar to me is Michael Sonnenreich, who was the executive director of the staff of the Shafer Commission, the President's Commission on Marihuana.

Mr. MARTIN. It has been suggested by some people, Dr. Powelson, and among them Mr. Edward M. Brecker, a drug analyst for Consumers Union, that marihuana might be a more benign substitute for alcohol. I would like to quote a passage from Mr. Brecker and have your comment on it. Mr. Brecker said, "A knowledgeable society, noting a few years ago that some of its members were switching from alcohol to a less harmful intoxicant, marihuana, might have encouraged that trend. It may not be too late to present that simple public health message"

What do you think about that?

Dr. POWELSON. Well, he is wrong on two counts, one is that it is not a substitute; it is, among the young people in particular, being used more and more together.

Second, when used together, alcohol plus marihuana, they mutually reinforce each other. Finally, I don't agree that marihuana is a more benign drug than alcohol, I think it is more dangerous for the reasons I discussed, and others, too.

Mr. MARTIN. Well, that runs counter, as you know, to the popular impression, that alcohol is far more dangerous. Can you give us any more reasons why you consider marihuana to be more dangerous than alcohol?

Dr. POWELSON. The one I mentioned is the effect on thinking.

Senator EASTLAND. Could you raise your voice a bit?

Dr. POWELSON. The one I mentioned is the effect on thinking. Second, marihuana, as used by the regular users, say it is used twice a week, the concentration in the brain is cumulative—it stays in the brain. So that people who are using marihuana are subclinically stoned all the time.

Mr. MARTIN. Using marihuana how often—once a week—twice a week?

Dr. POWELSON. They then use one joint to raise the level of feeling again, but are still under the effect. Alcohol leaves within 24 hours, marihuana is in for days to months. Its effect on the brain is much more rapid than alcohol. The mental effect that I have been describing from marihuana take in the neighborhood of 3 years. That much has been demonstrated. Alcohol takes ten times that time. It is also very probable that it causes lung cancer.

Mr. MARTIN. It has been suggested, Dr. Powelson, that legalization might reduce marihuana consumption by depriving it of the "forbidden fruit" attraction. Do you think there might be something to that?

Dr. POWELSON. No, I know of no evidence that that is true. I believe that the law has several effects, one is, simply educational; it is also important for the people who don't want to use it that they be able to say to themselves or others that they are afraid of the consequences. So, I think the "forbidden fruit" theory has very little claim to plausibility.

Mr. MARTIN. Would it be possible, in your opinion, to legalize marihuana, and keep hashish and liquid hashish illegal?

Dr. POWELSON. I see no way to do that.

Mr. MARTIN. Do you believe in removing all penalties for simple possession for personal use, which is, as you know, one of the recommendations of the Shafer Commission?

Dr. POWELSON. No, I do not, for the reasons I already mentioned. I want to keep some kind of penalties, partly to retain the sanction, partly for educational reasons and partly for young people who want to stay away from it.

Mr. MARTIN. What kinds of penalties would you suggest keeping?

Dr. POWELSON. Well, essentially the ones we have in California now, what they amount to is a misdemeanor for possession. The user, with a small amount, is put on probation with the provision of erasing the arrest from his record after a period of time after the probation is terminated.

Mr. MARTIN. There are many reports, Dr. Powelson, over the past

5 or 6 years, that high school teachers in all parts of the country have been confronted by a steady year-by-year decline in student performance. They find students are less motivated; students seem to find it more difficult to focus and understand; they work less; they are more unruly. The result has been that many teachers who used to enjoy teaching find the profession increasingly difficult and are thinking of getting out of it; and this is supposed to be a nationwide trend.

In your judgment, could this phenomenon be related to the upward spiraling epidemic of cannabis use in high schools?

Dr. Powelson. I suppose it could be; I don't have any way of proving it, or knowing whether there is, or is not, a connection. I can answer concretely from my own experience that individuals, once they begin using cannabis, for a number of reasons their academic performance falls off. No. 1, again, it interferes with their thinking at some point; No. 2, motivation becomes less and less. anybody can attest to that on a college campus or high school campus. The trouble is that there are so many other things going on simultaneously. I think one of the things about drugs, the younger the user, the more likely the effect will be—the effect on maturing and learning will be greater. That is, the younger the user, the greater the effect.

Mr. Martin. You mentioned other factors and phenomena. What are the other factors?

Dr. Powelson. The whole educational system is undergoing major changes. Just last week one member of the Berkeley School Board said in the process of choosing a new superintendent of the schools. "We are not interested in a superintendent of schools who wants to teach reading and writing; we are interested in a superintendent who wants to teach our kids how to seize power." And that was seconded by another member of the school board.

The superintendent of schools, when he took office, said, "There are no failures of students, there are only teachers that are failures." When all the students heard that, of course, that was a prime kind of notice that they didn't have to try anymore. So, I think we have many alternatives. The schools in Berkeley are financed by the Federal Government. They don't teach reading and writing, they are teaching people to feel good. All of these things are going on, and I think the use of drugs and the deterioration of the school system are probably parallel and intertwined.

Mr. Martin. You feel they go hand in hand?

Dr. Powelson. I do.

Mr. Martin. There are conflicting views, Dr. Powelson, as to whether or not marihuana leads to violence. What is your own view on this, based on your personal experience?

Dr. Powelson. The fact that there were exaggerated reports in the 1930's that were referred to by a previous witness, I agree to. On the other hand, I first believed that marihuana users, when they were high, they were cool and loving. I have come to see that this is an intermediate stage, fantasy, or illusion. They look amiable

enough, but when you begin interfering with the use, to take it away from them, you can have a very ugly situation.

My own experience is that with heavy users, when they are crossed in the area of their use of drugs, or their ideology, you run, as I said, into very ugly situations.

Mr. MARTIN. That concludes my questioning, Mr. Chairman.

Mr. SOURWINE. May I ask a question of Dr. Powelson?

Senator EASTLAND. Of course.

Mr. SOURWINE. Sir, my understanding of the summarization, what you told us with respect to decreasing performance among high school students and its possible relation to marihuana or cannabis use is, that a substantial number of students use the drug, and you know it will affect the downgrading of the average performance level. But, the fact that the average performance level goes down doesn't necessarily increase the use of hashish or marihuana; that might be caused by a number of other factors that you mentioned.

Dr. POWELSON. Yes.

Mr. SOURWINE. You gave us a discussion of what appeared to be to me the overall effects of use of cannabis. You talked about a student designated as "S.", who continued to use marihuana and hashish. It wasn't clear whether he moved progressively first to larger quantities of marihuana and then hashish. Is that the way it went?

Dr. POWELSON. It doesn't follow a pattern. This particular young man, he was also wealthy and spoiled, and he moved very fast from marihuana to hashish because he was looking for highs, he didn't "progress." The usual pattern, I would say, is using low-grade quality, and then, as people become tolerant, they are looking for more and more highs, and they are moving gradually from better quality marihuana to hashish. But some people jump immediately from one to the other. This particular person jumped immediately from marihuana to hashish.

Mr. SOURWINE. One final question, sir. You discussed an increasing number of patients who were found to be using marihuana. Now, there was at the same time, from 1965 to 1972 an increased use of marihuana in the entire student body; was there not?

Dr. POWELSON. That is correct.

Mr. SOURWINE. Can you relate in any way the percentage of increase, or the degree of progression in the student body, to the percentage of increase or degree of possession of marihuana among your psychiatric patients?

Dr. POWELSON. We did surveys all the way through, in which we compared our students in the student health service, in the psychiatric clinic, with the general population, and we never found any difference. The students in the Student Health Service were not using any more, or any less, than the general population.

Mr. SOURWINE. In other words, you are saying you were examining more psychiatric patients who used marihuana because there were more users among the student body as a whole, rather than because marihuana made them psychiatric patients.

Dr. POWELSON. That is correct.

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Mr. SOURWINE. Thank you. I have no further questions.

Mr. MARTIN. Our next witness will be Dr. Henry Brill. Would you come forward? You have a prepared statement, Dr. Brill, on your qualifications, so it won't be necessary for me to question you on your qualifications.

Dr. BRILL. Thank you.

Mr. MARTIN. Would you identify yourself?

TESTIMONY OF DR. HENRY BRILL, REGIONAL DIRECTOR, NEW YORK STATE DEPARTMENT OF MENTAL HYGIENE

Dr. BRILL. I am Dr. Henry Brill of West Brentwood, Long Island, N.Y., where I am regional director in the New York State Department of Mental Hygiene.

I have submitted a curriculum vitae which states my qualifications in the field of drug dependence. These qualifications include past or present membership and/or chairmanship of the American Medical Association, the World Health Organization, and the FDA. I also had for almost a decade major responsibility for the development of the narcotic treatment program for New York State.

I am here today as an individual and not as a representative of any organization, but I was a member of the National Commission on Marihuana and Drug Abuse [1] throughout its period of operation, and I am concerned about the misinterpretations which have developed with respect to the marihuana report of that Commission. These misinterpretations result from reading the reassuring passages in the report and ignoring the final conclusions and recommendations, and the passages in the report on which they were based. As a result it has been claimed that the Commission's report was intended to give marihuana a clean bill of health, and as a covert, or indirect support for legalization of this drug in the near future, or as a step in that direction. Nothing could be further from the truth.

From my knowledge of the proceedings of the Commission, I can reaffirm that the report and the subsequent statements by the Commission meant exactly what they said, namely that this drug should not be legalized, that control measures for trafficking in the drug were necessary and should be continued, and that use of this drug should be discouraged because of its potential hazards.

Mitigation or abolition of penalties relating to private use were recommended purely on practical and humane grounds. The position is clearly stated in the closing pages of the first Report "Marihuana—A Signal of Misunderstanding", specifically on pages 150–178. Among the cautionary statements one can list the comments on hazards of prolonged and heavy use, on page 66; the paragraphs on behavioral effects, psychological dependence, and possible organ damage and psychosis, page 59; and the hazards of further spread of the habit, on page 82; the notes on the amotivational syndrome, page 86; and the association of marihuana use with other drug use, page 46. On pages 119 and 120 we find an account of the consensus of

[1] Marihuana—A Signal of Misunderstanding—First Report of the National Commission on Marihuana and Drug Abuse; U.S. Government Printing Office, Washington, D.C., 1972.

the medical profession that marihuana use constitutes a hazard to the individual, that the drug should not be legalized, and that m re research is needed. On page 175 we find a statement concerning the need to detect and punish persons operating vehicles and other dangerous equipment under the influence of marihuana.

Contrary to what has been claimed there never was any intention to indicate in the Commission's report that we already knew enough about marihuana in 1972 to justify its legalization. Instead a major section of the report is devoted to the need for more research.

In summary I would say that I found myself in complete agreement with the conclusions of the Commission and my attitude was reinforced by personal observations in mental hospitals here and in Greece, Morocco, and Jamaica during my work with the National Marihuana Commission.

Scientific reports which have become available since the report was written confirm still further the need for caution. The newer data includes clinical reports which have continued to become available concerning complications of acute and chronic use; descriptions of mental deterioration and acute psychotic attacks [2] [3] after cannabis in reports from India; evidence of high incidence of impaired lung function; [4] further data on flashbacks in LSD users which seem to be associated with subsequent marihuana use; [5] and reports of acute psychotic reactions from even small amounts of cannabis in certain cases.

Finally, one should note the comment from Jamaica [6] [7] in the West Indies where the effects of cannabis had been thought to be relatively benign; among the middle class it is now found to be associated with school dropouts, transient phychoses, panic states, and adolescent behavior disorders. In general the effects of the drug continue to be noted as subtle and insidious. I would like to emphasize that one way to describe the effect of cannabis: it is subtle and insidious, but harmful reactions in the heart and circulatory system are suspected, and there are indications of adverse reaction in the body's anti-infection chemistry.[8]

Finally, some older issues are being reopened and evidence is that physical dependence does occur with very heavy use and that withdrawal leads to physical sickness in man and in animals.[9] These are but a few illustrations chosen almost at random to show that the latest scientific literature strongly supports the cautionary position of the Commission. I may add that in my own view marihuana must still be classed as a dangerous drug, dangerous to enough people to

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[2] Psychotic Reactions Following Cannabis Use in East Indies, G. S. Chopra and J. W. Smith; Arch. Gen Psychiatry, Vol. 30, January 1974, p. 24–27.

[3] Bhang Psychosis, V. R. Thacore; B. Jour. Psychiatry (1973) 123, p. 225–229.

[4] Adverse Reactions Associated with Cannabis Products in India, Wm. Grossman: Annals of Internal Med. 70:(3) 529–533, 1969.

[5] Marihuana Flashbacks, M. D. Stanton; Amer. Jour. of Psychiatry, 130:12, Dec. 1973, p. 1399–1400.

[6] Australia-New Zealand Meeting, Report of paper by M. Beaubrun; Jamaica Psychiatric News, December 19, 1973, p. 9.

[7] Drug Abuse in Different Cultural Groups in Jamaica—Summary for Oct. 15–19 meeting, Sydney, Australia, M. J. Beaubrun; Mimeo (undated).

[8] Inhibition of Cellular Mediated Immunity in Marihuana Smokers, G. Nahas; Science, Feb. 1, 1974, p. 419–420.

[9] Tolerance to and Dependence on Cannabis, S. Kaymakcalan; Bull. on Narcotics, Vol. XXV, No. 4, December 1973, p. 39–47.

warrant full control. I don't distinguish sharply between hashish and marihuana; these are different concentrations of the same principle.

This concludes my statement, Mr. Chairman, and I would now be pleased to answer any questions which you and the committee may have.

Mr. MARTIN. Thank you very much, Dr. Brill.

You said you were concerned over the misinterpretations that developed with respect to the Shafer Commission report. I want to quote what you said, "These misinterpretations result from reading the reassuring passages in the report, and ignoring the final conclusions and recommendations."

Now, who was responsible for these misinterpretations, was it the media, was it the academic community, promarihuana pressure groups?

Dr. BRILL. It is hard to point the finger at anybody, but I think there is a great deal of wishful thinking involved; and a lot of people wish that this source of pleasure were completely harmless. and therefore it was rather easy to believe in it, and to shut off all negative information that might be available.

Mr. MARTIN. Can you give us a clearer idea of what you have in mind?

Dr. BRILL. Yes, I think it also could be said that the information which has been available in the public media in the last year or two has tended to emphasize the harmlessness of marihuana, and to understate the other side of it.

Mr. MARTIN. To get a clearer idea of what you had in mind by this statement, Dr. Brill, I would like to ask a few questions on an article on the Shafer Commission's report, which appeared in the U.S. News and World Report on April 7, 1972. The heading on this article was, "Evils of Marihuana—More Fantasy Than Fact?" Do you think that conveyed a fair representation of the essential thrust of the report?

Dr. BRILL. I don't think it did. I think it could mislead, especially in view of the "wishful thinking" that many people had in this field.

Mr. MARTIN. Let me quote a few items selected by the U.S. News from the report, and ask for your comments on that. The article in U.S. News quoted the report as saying, "Cannabis does not lead to physical dependency. No tortuous withdrawal syndrome follows the sudden cessation of chronic heavy use of marihuana." Has that been established in any way in recent research?

Dr. BRILL. Yes, there is a recent publication, and I think I have given you a reference on the subject, a publication in the U.N. Bulletin on Narcotics, which indicates that after heavy administration real withdrawal symptoms can be elicited in animals, monkeys; and there is a strong suspicion they do occur in human beings. However, in all fairness, ordinary level use does not produce physical withdrawal symptoms. It does, however, in some people, lead to a considerable amount of irritability; and Dr. Powelson mentioned that.

Mr. MARTIN. Irritability which could be translated into violence under certain circumstances?

Dr. Brill. Well, among certain people under certain circumstances. I am not convinced that as a drug marihuana specifically is marked by violence in our culture. Other cultures have described it, and that is a curious contradiction that still remains to be clarified.

Mr. Martin. The second question on the U.S. News article: The article says: "Recent research has not yet proven that marihuana use significantly impairs driving ability or performance." In the light of recent research, pointing to some serious defects in driving ability, don't you agree that this finding might have to be reconsidered?

Dr. Brill. I think it may well have to be reconsidered, but I would want to see it proven that the drug is safe for driving under field conditions. We have enough hazards on the roads without taking chances with intoxicants. That still remains to be tested in the laboratories to the satisfaction of some people. It stands to reason that an individual who is intoxicated with a substance that interferes with measurement of time and distance, that may produce hallucinations, may very well be a hazard on the road.

May I add one more thing. We had an interview with a marihuana using group in Chicago when I was with the Commission. We point blank asked them what they thought about having people ride motorcycles under the influence of marihuana; and these were marihuana users, middle-class cultured people. They agreed completely that that was not a good mixture, and they would not approve of it. So, they must from their own personal experience have felt there must be some interference with efficiency.

Mr. Martin. That would correspond with the knowledge that every drinker has when he is intoxicated—that he doesn't drive as well when he is under the influence of alcohol?

Dr. Brill. I think so.

Mr. Martin. On the nature of the epidemic in the United States, the U.S. News quoted the following paragraph, "We are inclined to believe that the present interest in marihuana is transient, and will diminish in time of its own accord, once the symbolic aspect of use is deemphasized, leaving among our population a relatively small coterie of users."

Wouldn't you say that the statistics that were presented here today suggest that things may be moving in the opposite direction?

Dr. Brill. I am afraid they do. Of course all drug abuse, if you want to call it that, all use of drugs for social and recreational purposes has a fad-like quality to it; but there is no evidence that was presented here today to indicate that we are in a downswing.

Mr. Martin. From the several replies you have given, Dr. Brill, it is apparent you believe that new scientific evidence which has emerged since your report was written—it was written in late 1971, beginning of 1972—would make it necessary to reconsider a number of your findings and recommendations. Is that a correct statement?

Dr. Brill. Well, when the report was written we fully recognized that the conclusions would have to be reconsidered in the light of advancing knowledge. Knowledge is advancing, and I think that all these conclusions could very well be subject to reconsideration as time goes on, yes.

Mr. MARTIN. Do you feel, for example, that this new knowledge might perhaps point to the need for reconsidering the Commission's recommendation that all penalties be removed for simple possession of small quantities of marihuana? Would you for example now favor, as Dr. Powelson apparently does, the retention of some minor penalty for possession, perhaps a warning the first time, a fine the second time, a stiffer fine the third time, and so on?

Dr. BRILL. I might very well, although I must admit that I don't pretend to have any knowledge of the law, or the effectiveness of the law in this field. So, I intend to restrict my comments to what the hazards are. How they are to be viewed by the law really would fall outside my domain.

But as an outsider I would have to agree that some kind of a minor penalty might very well be considered.

Mr. MARTIN. Would it be correct to infer from the answer you have already given, Doctor, that if the Shafer Report would be reissued today in an updated version, you would consider it important to extend the report to include references to the recent research you referred to, and perhaps amend some of your recommendations in light of this research?

Dr. BRILL. It is hard to second-guess a group like the Commission; but as to the first part of your statement, it is certainly true, it would have to be brought up to date. How that would influence the final outcome I wouldn't be able to say. And in making this reply, I have in mind the long, extensive discussions that occurred. These conclusions were not hatched out extemporanously, they were the result of a great deal of discussion and thought.

Mr. MARTIN. In your statement you used the words "insidious and subtle"—the phrase "insidious and subtle"—to describe the effects of cannabis. Could you spell out in some more detail what you mean by "insidious and subtle"?

Dr. BRILL. Dr. Powelson has already referred to one aspect, and that is the chronic effects of cannabis. The chronic disabling effect of alcohol tends to become fully apparent after 10 to 20 or more years after excessive alcohol abuse, whereas in the case of cannabis this slides in insidiously, and within 2 or 3 years an individual has problems, and it takes some technical and professional experience to realize where this came from because the symptoms look like a rather nonspecific loss of social and economic capacity, and nonspecific general withdrawal from the competitive life; and a general tendency to be lost in pseudo-elevated forms of conversation, a syndrome which doesn't point to anything in particular unless one is familiar with this drug.

Now, in the acute effects, the short-term effects, especially when small doses are used, there is very little to see; only when heavy doses are used, when there are pathological intoxications can one see a real explosive immediate effect.

Now, contrast that to alcohol where an acute intoxication leads to slurred speech, ataxia, and symptoms that can be picked up immediately, including the odor on the breath. It is far more difficult to identify someone equally intoxicated from marihuana. He can

straighten up and with an effort of will can really compensate for all of the disabilities to superficial examination.

Mr. MARTIN. You made the point, Dr. Brill, that the media in general covered the report of the Shafer Commission in a one-sided manner, that they ignored, or misrepresented in some cases the basic thrust of your report. Has this one-sidedness carried over to other areas? Would you agree or disagree, for example, with the chairman's opening statement, and I want to quote what he said, "There has been widespread publicity for writings and research advocating a more tolerant attitude towards marihuana, while there has been little or no publicity for writings or research which point to serious adverse consequences."

Dr. BRILL. As I read what is in the media, and hear it, I must admit that the favorable side for marihuana is more heavily presented than the unfavorable side. I can't agree with this kind of emphasis; I think it needs more balance. There have been both sides presented in many cases, but overall I am afraid that the statement is quite correct.

Mr. MARTIN. The chairman also said in his opening statement the purpose of these hearings was to present the other side, the side that by and large has not been heard by the Congress and the American people, so that both the Congress and people would have an understanding of both sides of this controversy.

Would you concur in the judgment that the presentation of the other side is badly needed?

Dr. BRILL. I think it is. I think it needs to be emphasized. The Commission report, I thought, presented a fairly balanced picture; but what emerged from it, in the public consciousness, was quite unbalanced. So, I would completely agree: the negative side of this picture, the unpleasant side, has to be faced.

Mr. MARTIN. The subcommittee has received evidence that noted scientists whose research and analyses pointing to serious adverse consequences have come under violent personal attack, including public and private harassment from members of promarihuana lobbies, and even members of the scientific community associated with the promarihuana lobby. Do you have any personal knowledge of such attacks on fellow scientists?

Dr. BRILL. I have seen this happen on several occasions, yes; I was quite distressed by it.

Mr. MARTIN. Mr. Chairman, I have no further questions.

Mr. SOURWINE. Sir, from what you have just told us about physical dependency among heavy users of cannabis, and withdrawal effects, is it fair to summarize by saying that in light of all that is now known on the subject, it is not scientifically correct to call cannabis, marihuana or hashish, a nonaddictive drug?

Dr. BRILL. That is a very difficult scientific question to answer; it can produce physical dependence, so I think if this information is confirmed by subsequent studies, then we will have to revise our opinion. But, it would be premature to make a major change on the basis of the very few studies that are as yet available.

Mr. SOURWINE. Dr. Brill, in an area like this, and attempting to

form a judgment about an issue such as this, isn't it true that it's not a question of a popularity contest, or a vote; if no ill effects are found in the drug over a period of sufficient time with enough investigations and experiments, then we may say that it is a safe drug. But, as soon as you do find under controlled experiments, properly carried out, evidence of danger, you may no longer call it a safe drug; is that correct?

Dr. BRILL. I think that is entirely correct, but I must say that the argument, where the line is drawn about how safe, or how unsafe—my own personal opinion is that this is sufficiently unsafe, so that it should not be legalized. There are some people who say that no drug is safe, all drugs are unsafe, all drugs are the same. I think this is misleading, and I think that this drug is unsafe for enough people, so that it should not be made generally available.

Mr. SOURWINE. I have no further questions.

Senator EASTLAND. Thank you, Dr. Brill.

Mr. MARTIN. Our next witness, Mr. Chairman, is Dr. Donald B. Louria from the New Jersey Medical School. Dr. Louria, would you come forward?

TESTIMONY OF DR. DONALD B. LOURIA, NEW JERSEY MEDICAL SCHOOL, NEWARK, N.J.

Dr. LOURIA. I am Donald B. Louria, professor and chairman, Department of Preventive Medicine and Community Health, New Jersey Medical School, Newark, N.J.

Mr. MARTIN. I would like to ask you a few more questions for the purpose of establishing your qualifications, Dr. Louria. You are a graduate, cum laude, of the Harvard Medical School in 1953?

Dr. LOURIA. That's correct.

Mr. MARTIN. You served as chairman of the Subcommittee on Narcotics of the Medical Society of New York County from 1965 to 1966?

Dr. LOURIA. That is correct.

Mr. MARTIN. You served on the Council of the Committee on Alcoholism and Drug Abuse, Medical Society of the State of New York from 1966 to 1969?

Dr. LOURIA. That's right.

Mr. MARTIN. You were chairman and president of the New York State Council on Drug Addiction from 1965 to 1972?

Dr. LOURIA. Yes, sir.

Mr. MARTIN. You are the author of three books on drugs, "Nightmare Drugs", "The Drug Scene", and "Overcoming Drugs"?

Dr. LOURIA. That's correct.

Mr. MARTIN. Thank you very much, Dr. Louria, will you proceed with your prepared statement?

Dr. LOURIA. I have been asked to briefly review the epidemiology of drug abuse in this country from the point of where we are and how we got there.

In the 1930's, the major problem was, of course, heroin, and the evidence suggests that this drug, used primarily within economi-

cally deprived communities represented an escape from psychological pain or from the depressing effects of a relentlessly bleak environment. In striking contrast, the startling epidemic of the 1960's and early 1970's in which marihuana, LSD, and heroin were all participants, was propelled by a virtually monolithic hedonistic focus in the United States. This dominance of the search for pleasure has been abetted by our marvelous communications proficiency that permits any given fad to spread throughout the country virtually instantaneously.

The division of Drug Abuse and Biostatistics of the Department of Preventive Medicine and Community Health at the New Jersey Medical School in Newark have been analyzing the nature and severity of the drug scene in suburban communities in northern New Jersey for the past 5 years. These surveys of some 20,000 teenagers have been conducted by cross-sectional analysis in a substantial number of junior and senior high schools and by longitudinal analysis in two communities.

The data show that the three major reasons listed by the students for drug use—the influence of the peer group, curiosity, and the search for pleasure—have not changed during that 5-year period. Interestingly, if one looks at over 20 factors that to a greater or lesser extent promote drug use, the statistical evidence shows that far and away the most important is the influence of the peer group.

The studies performed longitudinally suggest that the use of illicit drugs is reaching a plateau in this country. I am talking now primarily about our own studies, and what we found in the past couple of years is conversant with most of the other studies in the country. The results can be best illustrated by looking at the results of a recent questionnaire study of grades 10, 11, and 12 in one high school. In the survey conducted during the last academic year grade 12—last year's seniors—showed an increase in use of a variety of drugs, including marihuana, hashish, LSD, and cocaine. Grade 11 was substantially different, there was a continuing increase in marihuana use, but use of every other drug was stable. In grade 10, marihuana use was stable and use of all other illicit drugs declined. These are extremely encouraging results, the first we have seen since the start of this epidemic. There is at present no reason for either precipitous or hysterical action on the one hand, or insouciance on the other.

Three of the trends are particularly worthy of note:

First, it appears that the slope of the curve of increasing use in grades 11 and 12 has flattened; that is, the rate of increase in the last year has slowed.

Second, there is a substantial decrease in the ratio of regular or weekly use of marihuana to experimentation with this drug. In other words, there are more people who are experimenting but relatively fewer who are regular users. Furthermore, there is increasing evidence that the relationship of marihuana to other drugs is diminishing. There continues to be a great deal of experimentation with marihuana, but a smaller percentage of marihuana experimenters will utilize drugs such as hashish. So, I think in terms of the current epidemiologic studies it is improper to suggest that virtually

everybody who uses marihuana will also play around with hashish. Certainly in our study that is not true, and the figure—marihuana smokers who use hashish—ranges from 12 to about 50 percent, depending on the school group studied.

Third, the girls have, by and large, now caught up to the boys, and in some areas surpassed them in overall prevalence of nonmedical drug use.

In regard to marihuana, there is, of course, a continuing controversy over its legalization. It seems to me that, thus far, the decisions have been made without serious consideration of the two major issues. Surely, we would all agree the drug is neither horrendously dangerous nor perfectly safe, but this has been known for over 100 years. The two egregiously neglected issues are (a) the relationship between use of marihuana and the use of a drug such as LSD, and (b) the number of intoxicants we wish for general use in our society.

We have been particularly interested in seeing whether there is a relationship between the frequency of marihuana use and subsequent use of LSD. We have carried out three epidemiologic studies, all of which show similar results and are appended as graphs 1 to 4. It may be seen that the more often marihuana is used, the more likely it is that an individual will experiment at least once with LSD. In one of the three studies, for example, the infrequent user of marihuana had a 4 percent likelihood of using LSD; for the monthly user, the chance of using LSD increased to 9 percent; the weekly marihuana user had a 22 percent likelihood of experimenting with LSD, and among those who used marihuana more than once per week, the likelihood of trying LSD increased to 44 percent. The results in the other two studies we have carried out were similar. In fact the daily marihuana user in the studies we performed, and various studies across the country that were performed has a likelihood of using LSD somewhere between 65 and 85 percent.

Mr. Sourwine. In the use of LSD?

Dr. Louria. Right.

In the absence of contravening data and in the presence of other supporting studies, the relationship we have found between marihuana and the more dangerous drug, LSD, appears reasonably secure. We do not imply that marihuana use compels use of more dangerous drugs. In fact, excluding the daily marihuana user, the majority of those smoking marihuana will not use LSD or similar drugs. Furthermore, as I emphasized before, our data suggest that the relationship between marihuana and hashish, or marihuana and LSD is actually diminishing, not increasing, as far as our studies are concerned.

However, the relationship between regular use of marihuana and the use of LSD subsequently does exist; and this fact virtually mandates further analyses. We obviously must look at the possible reasons for this relationship, and we must ask ourselves whether marihuana legalization would inadvertently bring with it the increased use of more dangerous agents such as LSD. In any case, we should not legalize it until we have carefully looked at the relationship and decided precisely what it means, and what it portends.

The second major issue to me is the overriding one. This is the number of intoxicants we wish in our society. Currently, we have three major legal drugs of pleasure, caffeine, nicotine, and alcohol. Caffeine is relatively safe; nicotine is said to cost us between 60,000 and 300,000 deaths and $19 billion in economic loss each year; alcohol costs us at least 40,000 and probably nearer 100,000 lives yearly and at least $15 billion in economic loss per year. The question is, do we wish to add a fourth intoxicant, marihuana, to our other three?

If we do legalize marihuana, we will impose this fourth intoxicant on our children, grandchildren and great grandchildren, for once a new intoxicant is legitimatized and accepted by the public, it cannot subsequently be arbitrarily proscribed. That is what we learned from prohibition. The obvious question is, how many intoxicants can we have for general use and still remain a vigorous and productive society? No society can afford an unlimited number of unrestricted intoxicants. It seems to me we need to consider this very carefully indeed. George Bernard Shaw said, "We are made wise not by the recollections of our past but by the responsibilities of our future." It is not our present pleasures that should be our major concern, but rather the effect a fourth legal intoxicant will have on the well-being, happiness and prosperity of future generations.

It is important to stress that the only question before our society is whether to add new intoxicants to those already troubling us. I personally believe this is the wrong question. What we should be considering is substitution of less toxic pleasure-giving substances for alcohol and/or tobacco. It is after all somewhat mind-boggling to realize that in the United States there are about 2 million deaths each year and that somewhere between 5 and 15 percent of these can be directly or indirectly attributed to alcohol and tobacco.

In preparation for this I rearranged some of our fatality statistics for each year and came up with some data intriguing to me, namely that our legal intoxicants cause more deaths than all diseases, including pneumonia and tuberculosis reported yearly by the Center for Disease Control. Indeed, if we do rearrange these figures to allow these intoxicants as listed as a cause of death, the five leading causes of death in the United States are: (1) heart disease, (2) cancer, (3) stroke, (4) legal intoxicants, and (5) accidents. And we are talking about adding more intoxicants.

It seems to me only prudent and logical to concentrate more on reducing the morbidity and mortality from legal intoxicants before adding new ones with their own dangers. The only new intoxicant that could be added without much debate would be the one that is turly harmless and marihuana is clearly not innocuous. I personally would like to see us consider substituting two less toxic agents for alcohol and tobacco, or alternatively, we could consider substituting marihuana for alcohol and modifying tobacco to reduce its cardiovascular toxicity and its cancer causing proclivities.

Whatever the decision, it should be based on a careful and dispassionate consideration of the number of intoxicants available in our society, their relative risks, and our legitimate needs for mind-altering, pleasure-giving substances. I do not feel there is anything particularly arcane or complicated about the marihuana issue. Surely,

we ought to be able to approach it intelligently, make sensible decisions and then utilize our energies to solve the far more important problems facing our society, which, if allowed to fester, threaten both our meliorism and our future.

Mr. MARTIN. Thank you very much, Dr. Louria. Before I proceed with the questions, I believe you provided some charts, the first of which is the relation of frequency of marihuana use to likelihood of LSD use.

Dr. LOURIA. That's correct.

Mr. MARTIN. It shows an upward curve—the more marihuana is smoked, the more likely they are to indulge, experimentally or repeatedly, in LSD use. Why do you think there is a special relationship between marihuana use and LSD use?

Dr. LOURIA. Let me emphasize first that we have two somewhat opposing trends. One is, as I indicated in my testimony, that experimentation continues, although leveling off; and within the experimenting group the relationship between occasional experimentation with marihuana and utilization of the other drugs is diminishing, not increasing.

On the other hand, among those who utilize marihuana regularly, the relationship between that and the utilization of LSD persists.

Now, your question is why, and we don't have the answer, and nobody else has the answer. I think we can say that the first graph indicates that this is by and large a straight line relationship; the more frequently you use marihuana, the more the likelihood is that you will use LSD; there is a clear statistical correlation.

Does this mean that marihuana drives one to LSD? Of course not. There are at least seven potential reasons to explain this relationship, and in fact two of them could be utilized favorably in the argument for legalization of marihuana; those two include first the concept of the thrill of illegality. In other words, once you use the drug you then are beyond the pale of what is accepted as normal in society; and it is more easy then for you to slip into the use of other illegal drugs.

Second, the same person who sells you marihuana sells you LSD, therefore, remove marihuana from the illegal relationship with LSD and you break that chain.

The other five potential reasons would, to me anyway, militate against the legalization of marihuana. The first of these is curiosity, one of the major reasons for the use of illicit pleasure-giving drugs in our society. An ancient saying that goes, "A man should live if only to satisfy his curiosity". That in itself may explain a good deal of this relationship.

Second is hedonism—that is we are very much a pleasure-oriented society that has a great deal of difficulty in subordinating its pleasure to goal-directed activities. And if a society is concentrating as much as we are on pleasure, it's almost inevitable that those who enjoy mind alteration of one kind, such as marihuana, and use it regularly, will opt for more potent drugs that produce similar "highs".

Third is the influence of the peer group. Our study, and every study performed across the country, indicates that if you are in a

multidrug using peer group you are much more likely to be a multidrug user.

Fourth, I think that 10 years from now we might find that there are valid biochemical or physiologic interrelationships between a drug such as marihuana, and a drug such as LSD. I emphasize, there is not one iota of evidence now to support that hypothesis, but I think it is possible that there is a relationship.

Fifth, I think it is terribly important to emphasize that at least in our experience and the experience of others, among those with substantial covert or overt psychological abnormalities use of one drug is often followed rapidly by multidrug use. I have always felt that those who urge the legalization of marihuana were frequently at least suggesting that an individual could always decide his drug use on a volitional, carefully thought out basis. That just is not true for people who have psychological problems. We have found that they are often virtually propelled into severe multidrug use.

Again, I have to emphasize that we have no specific knowledge why this relationship between marihuana and LSD exists. What bothers me—and I must say it bothers me about the Commission report, as I testified before, is that the report talked about an anachronistic and invalid relationship between marihuana and heroin. We always maintained there was no significant relationship between marihuana use and heroin use, and that is still true; but for the life of me I can't understand why the National Commission would hear noncontravened testimony on the relationship between a different drug, LSD and not even mention it in the report, instead discussing only this old relationship long shown to be invalid, between marihuana and heroin.

Mr. Martin. Dr. Louria, I will just ask a few more quick questions. We have one more witness, and we will have to move on as rapidly as possible.

There seems to be a rather basic conflict between the picture you presented—a tapering off of the cannabis epidemic at the high school level—and the statistics that were presented here this afternoon by the Drug Enforcement Agency, showing a massive increase in interdiction of both marihuana and hashish, going up year by year; and also a massive increase in the number of arrests on the Federal and local levels for cannabis offenses.

Could there be some explanation for this? For example, in your own report you made the point that girls are now using a lot more marihuana than they used to, and have caught up pretty well with the boys. So, while the boys have tapered off, the girls may have compensated?

Dr. Louria. That is true.

Mr. Martin. In addition to that, your report doesn't make any reference to the phenomenon of marihuana increase in grade schools, and actually there is very little research material on that? I think you will agree with that.

Dr. Louria. Yes.

Mr. Martin. We know it's there, we know that a lot of it has gotten down to the fourth and fifth grade level; but we don't have any statistics on it.

Dr. LOURIA. Well——

Mr. MARTIN. There is a substantial amount of marihuana being consumed at the grade school level, but we don't have any serious calculations on that, or estimates; would you agree with that?

Dr. LOURIA. I would agree with that to the extent that we have studied junior high schools.

Mr. MARTIN. I am talking about grade schools.

Dr. LOURIA. Well, we find the utilization in the suburban, predominantly white schools that we studied in the junior high schools, of small amounts. So, there was no reason at all in our communities to study grade schools. I personally think there is exaggeration about how severe the problem is in the grade schools. At least in the majority of communities it is really a very small problem. And as a matter of fact, there is nothing inconsistent with the data developed by the law enforcement agencies. We are measuring different things and there are bound to be discrepancies until the phenomena are analyzed over a prolonged period. So, I don't see any disparity between those data, and the data I presented.

Mr. MARTIN. One more question. There is another unmeasured area. It is generally agreed that marihuana has also moved upward into the ranks of adult society. People are now indulging in both marihuana and hashish, something they didn't do 10 years ago. The estimates that have been made, surveys that have been conducted, by and large don't touch this group. This is another area where there may have been a substantial increase in cannabis use without any accurate ability to accurately assess it.

Dr. LOURIA. Oh, yes; I don't think there is any question about that, a substantial part of the increase you have been talking about may be related to chronic, but not ordinarily heavy use in the post-college age.

Mr. MARTIN. Right. One final question, and then we will have to move on to our next witness.

You spoke of the possibility of substituting marihuana for alcohol as an intoxicant. Do you think that is a realistic proposal in view of the political and social and other difficulties affecting such a substitution?

Dr. LOURIA. No, I don't think that is likely going to come to pass, and I would personally oppose it on the grounds that marihuana isn't safe enough to be substituted for alcohol. The only point I would like to stress is that I don't think we can look at marihuana in a parochial fashion. You have to do it in terms of our total intoxicants, and the question of substitution to me is a very germane one. I can't, for the life of me, figure out why a society allegedly as intelligent as ours should tolerate hundreds of thousands of deaths a year due to our legitimate intoxicants. I think there is something we can do about that, either by substitution, or more effective education.

Mr. MARTIN. But not by the substitution of marihuana?

Dr. LOURIA. No, I just put that in as something that people talk about. My own convictions, are parallel to the other witnesses this morning, especially what Dr. Brill just said, namely that marihuana

has enough dangers so that it would not be a proper drug in the present form to substitute for alcohol.

Mr. MARTIN. Thank you very much, Dr. Louria.

Gen. Frank B. Clay, of the U.S. Army is our final witness.

General Clay, in the interest of expediting, I would suggest that instead of spending the time to establish your qualifications you provide a brief résumé for the record. Is that acceptable to you?

General CLAY. Yes.

Mr. MARTIN. Would you identify yourself for the record?

TESTIMONY OF MAJ. GEN. FRANK B. CLAY

General CLAY. Mr. Chairman, I am Major General Frank B. Clay, Deputy Assistant Secretary of Defense, Drug and Alcohol Abuse; it is a pleasure to be here today.

As Deputy Assistant Secretary of Defense for Drug and Alcohol Abuse, I am responsible for the prevention of drug abuse in the armed services through education programs, the identification of service members who abuse dangerous drugs and alcohol, and the short-term rehabilitation of those military drug abusers who will cooperate with their own treatment.

While DOD continues to vigorously investigate and prosecute serious instances of criminal drug abuse, such as selling and trafficking, that area is outside my realm of responsibility. These subjects can best be discussed by representatives from the Office of the Deputy Assistant Secretary of Defense for Administration who are concerned with law enforcement and are scheduled to appear before you at a later date.

As is the case with all drugs of abuse, the use of cannabis in any form continues to be regarded as a violation of the Uniform Code of Military Justice. While the Department of Defense does not condone nor tolerate the use of any psychotropic or mind-expanding drug by its members, we are aware that many impressionable young people are caught up in drug abuse through peer pressures, loneliness, boredom, and a high degree of exposure in certain foreign lands. These young people are certainly not criminals, but young Americans who may have been exposed to drug abuse on our high school and college campuses.

We, therefore, have made a deliberate effort to use a firm but humanitarian approach to the identification, treatment, and rehabilitation of these young service members, and have resorted to disciplinary action only as a last resort in those instances not involving purely personal use or possession for personal use.

Despite this revised approach during the last 3 years, we believe that the use of cannabis or its derivatives, or any other harmful drug is incompatible with our military missions. In some instances where we are unable to successfully treat a service member for drug abuse, we find it necessary to discharge that person from the service with a referral to the Veterans' Administration for the long-term treatment DOD is unable to provide. This is the Department of Defense Policy now in force with regard to cannabis and all other dangerous substances. This policy includes measures to pre-

clude the service entry of habitual drug abusers by thorough screening and interview at the Armed Forces Examining Entrance Stations; to prevent drug abuse through a vigorous education program at all levels; to identify drug abusers through our urinalysis screening program and other methods; to provide a voluntary self-referral to treatment program which guarantees exemption from punitive action for personal use and possession; and, finally, to treat and rehabilitate those drug abusers amenable to such effort to restore them as useful members of society without their records reflecting drug abuse.

The abuse of cannabis continues to be of a serious nature in the Armed Services; but since we are unable to chemically detect this drug in body fluids as we can morphine-based drugs, amphetamines, and barbiturates in our urinalysis screening program, we have no good reliable data on the incidence of the abuse of this drug in the Armed Services. However, the U.S. Army in Europe, a location where the incidence of cannabis abuse is believed to be high, has conducted a continuing survey of its personnel—and the results are in exhibit 1.

TABLE 1.—CANNABIS USE BY USAREUR PERSONNEL (SURVEY DATA)

Frequency of use	Average all ages				February 1974 survey by age groups			
	Previous surveys	January 1973 survey	August 1973 survey	February 1974 survey	20 and under	21–22	23–24	25 and older
Cannabis:								
Daily (in percent)	10–15	10	8	7	15	9	3	3
At least once (in percent)	40	48	53	46	78	62	47	11
Usable survey responses	16,700	1,374	1,463	1,759				

Source: Commandwide sample survey of cannabis use by U.S. Army, Europe (USAREUR) personnel. Data provided by headquarters, USAREUR.

The February 1974 results show that 7 percent of those surveyed admitted to the daily use of cannabis and 46 percent of those surveyed stated that they had tried cannabis at least once. Even though this survey was a relatively small one with under 1,800 respondents, the true incidence rate of cannabis use of other than an experimental nature will probably be somewhere between these two rates. I have included as exhibit 2 some other survey data which may also be pertinent.

WORLDWIDE SAMPLE SURVEY REPORTING MARIHUANA USE AMONG ARMY ENLISTED GRADES FEBRUARY 1974

TABLE 2.—SELF-REPORTING OF THE USE OF MARIHUANA OR HASHISH DURING THE LAST 6 MONTHS BY ENLISTED GRADE

Note: Survey question: Which term best describes your use of marihuana or hashish during the last 6 months?

	E–1	E–2	E–3	E–4	E–5	E–6	E–7	E–8	Total Responses
Never	48.2	55.6	55.8	65.2	85.0	94.8	96.6	96.4	69.4
Rarely	14.9	13.2	12.1	11.3	6.1	2.1	1.7	.4	9.4
Sometimes	19.4	15.8	15.3	11.0	5.6	1.8	1.0	1.2	10.8
Frequently	17.5	15.4	16.8	11.6	3.3	1.3	.7	2.0	10.4

Note: Total sample population 13,070.

You may also be interested to know that even though we are presently unable to detect cannabis in our drug screening program, ongoing research by a major pharmaceutical firm holds the promise of a radioimmunoassay test which will identify the heavy users of cannabis products, such as hashish or oil of hashish. All of our drug screening laboratories are now being converted to the radioimmunoassay technology at the present time, and we will be ready to apply this test as a very fine deterrent if a successful assay is developed.

The derivatives of cannabis also pose special problems for the Armed Forces which were not expressed in the Shafer Commission report of 1973. As you know, the basic active ingredient in plants of the genus cannabis is tetrahydrocannabinol or THC. Most ground marihuana as presently used in this country contains from about 0.5 to 2.0 percent THC. Hashish, the dark brown resin collected from the tops of cannabis plants contains about 10 percent THC. Hashish oil of cannabis, produced in a manner similar to the percolation of coffee, yields an even more potent dose which may be as high as 90 percent THC. Because of this extraordinary potency, one small drop of the oil placed on a regular cigarette and smoked can make an impressive "high". These two highly potent derivatives of cannabis certainly pose a much greater danger to service members than just the casual use of plain ground marihuana, regardless of the psychological or physiological effects which may exist with cannabis in its unmodified form.

As to the physical impact of cannabis used in small amounts by the casual or recreational user, it may interfere to a degree with physical performance which depends upon visual function. In relatively high doses which are common to the daily user of hashish or oil of hashish, cannabis regularly produces hallucinogenic effects, abnormal sensations such as numbness, difficulty with thinking, concentration or speaking, and altered perceptions.

The psychological impact upon service members is analogous to the overall effect on man in general as noted by other research. Cannabis use may be associated with certain less severe psychological reactions, such as depressive and panic reactions, particularly in inexperienced users. There is evidence which suggests that sudden exposure to unusually high doses, as might be the case at the present time with hashish as used by the newly arrived soldier in Germany, might cause a toxic psychosis. Other research shows that it is also probable that cannabis is a factor in some cases of chronic psychosis and lack of motivation, which conditions could have an adverse effect on the field performance of service members.

The essence of this report, therefore, is that while the DOD is making vigorous efforts to prevent the use of cannabis products by service members and to restore to effective and reliable functioning all individuals identified with problems attributable to cannabis and other drugs, we strongly support the continued control of all cannabis and its derivatives as dangerous substances. The Department of Defense also strongly supports the continued vigorous investigation into the effects of cannabis use. The results of such research can

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have an important bearing on the future combat readiness of the armed services.

As I mentioned before, matters involving security and law enforcement as related to the use of cannabis are beyond my realm of responsibility in the Department of Defense. However, it is my personal judgment as a line officer of some experience that service members who habitually use cannabis are security risks in certain assignments.

In anticipation of your questions regarding psychological and physiological effects of cannabis which may not be in my field of expertise, but medical in nature, I have brought an associate with me, Col. John J. Castellot, Sr., who is an Army medical officer and Chief of the Office of Alcohol and Drug Policy in the Office of the Surgeon General of the Army.

If you have questions other than those involving law enforcement matters, we will be happy to answer them at this time.

Senator EASTAND. Thank you, General.

Mr. MARTIN. General Clay, the subcommittee has received enough information from various sources to indicate that the cannabis epidemic is creating some fairly serious security problems. We have heard, for example, of service members who have been involved in trading sensitive information for bags of pot or hashish.

Do you personally know of such cases? I am not asking for specific case histories because we will be going into the impact of cannabis and security in the Armed Forces in more detail in executive session later; but have you heard of such cases?

General CLAY. I have heard of such cases second-hand. I have no direct knowledge of them.

Mr. MARTIN. Have you heard, or seen any reports that the widespread distribution of pot and hashish played a significant role in the riots aboard an aircraft carrier just over a year ago?

General CLAY. No, I haven't.

Mr. MARTIN. This is one of the matters that we will want to look into.

General CLAY. I would imagine this information would be available from the Navy's drug and alcoholic abuse officers.

Mr. MARTIN. Have the Armed Forces given thought to the point made by Dr. Powelson that it makes people more suggestible, more easily manipulated by agitators?

General CLAY. I think there has been thought given to it, but that certainly is not within the realm of my responsibility.

Mr. MARTIN. Right. Isn't it true, General Clay, that the U.S. Armed Forces in Vietnam, just before the heroin epidemic broke, were afflicted with a major epidemic of cannabis abuse?

General CLAY. That is correct.

Mr. MARTIN. Very strong cannabis, on the average 5 percent THC content. And it was bad enough so that in some units it seriously affected their fighting ability?

General CLAY. We understand that to be true.

Mr. MARTIN. Now, your presentation doesn't make it quite clear, General Clay, whether the Armed Forces have experienced the same qualitative escalation from marihuana to hashish as has been the case in the civilian sector. Do you find more hashish now than you found previously?

General CLAY. I think so, I think in Germany you will find that hashish is the principal drug of abuse.

Mr. MARTIN. Your chart in exhibit 1 suggests that there has been a marked decline in cannabis use in the Armed Forces over the past several years. These figures, of course, are based on voluntary responses to questionnaires, are they not?

General CLAY. Yes, they are.

Mr. MARTIN. Now, this chart runs completely counter to the charts about the civilian sector that have been presented today by the Drug Enforcement Administration. On page 5 of your statement I notice that you indicate some personal skepticism over the fact that only 7 percent of the servicemen admitted to daily use of cannabis; and that 46 percent stated that they tried cannabis at least once.

Now, you point out, and I think correctly, that the incidence of use other than of an experimental nature probably would be somewhere in between these figures?

General CLAY. Right.

Mr. MARTIN. What this adds up to, really, is that, in the absence of something like the urine test you can't get an accurate picture from a voluntary reporting system?

General CLAY. That's correct.

Mr. MARTIN. If you consider the cannabis epidemic the biggest drug problem now confronting our Nation and our Armed Forces, do the Armed Forces have a specific educational program geared to the cannabis epidemic?

General CLAY. Not specifically to cannabis, but to drugs in general, we have a vigorous and widespread educational program in all of our service schools and throughout our military units.

Mr. MARTIN. Is there any emphasis on cannabis?

General CLAY. On all drugs. Cannabis is not singled out specifically.

Mr. MARTIN. Would you know whether this program is kept right up to date with new scientific information on the adverse effects of cannabis?

General CLAY. Yes, I think I can say that it is. If there is new information it is made available to the troops in the field; we do our best to keep current.

Mr. MARTIN. I have one suggestion I would like to offer. You may have seen the report of recent research conducted by Dr. Kolodny of Masters & Johnson, demonstrating that male cannabis users suffer up to a 44 percent drop in male hormones; and the sperm count goes down to the point where heavy users become clinically sterile; and that very heavy users sometimes become im-

potent. Wouldn't that information have a lot of impact on the average GI?

General CLAY. Yes, I am sure it would; and as a matter of fact Dr. Hardin Jones from California, Berkeley, discussed that with members of my office and our troops stationed in Germany.

Mr. MARTIN. Dr. Hardin Jones, by the way, will be one of our witnesses in the final session on May 20th.

Those are the only questions I have. Mr. Sourwine, do you have any questions?

Mr. SOURWINE. No.

Mr. MARTIN. That concludes our session, General Clay. Thank you very much for coming here, and I want to thank you for your testimony, which I feel is very useful.

[Whereupon, at 1:20 p.m., the subcommittee adjourned, subject to the call of the Chair.]

MARIHUANA-HASHISH EPIDEMIC AND ITS IMPACT ON UNITED STATES SECURITY

THURSDAY, MAY 16, 1974

U.S. SENATE,
SUBCOMMITTEE TO INVESTIGATE THE
ADMINISTRATION OF THE INTERNAL SECURITY ACT
AND OTHER INTERNAL SECURITY LAWS
OF THE COMMITTEE ON THE JUDICIARY,
Washington, D.C.

The subcommittee met, pursuant to notice, at 10:35 a.m., in room 1224, Dirksen Senate Office Building, Senator Edward J. Gurney presiding.

Also present: J. G. Sourwine, chief counsel and David Martin, senior analyst.

Senator GURNEY. The subcommittee will come to order.

Today we shall be continuing our hearings on the marihuana-hashish epidemic and its impact on U.S. security.

The hearing today will focus on the medical effects of cannabis. For the purpose of this hearing we have brought together a panel of internationally distinguished scientists who have done major research on cannabis. Among them are: Prof. Robert Heath. Dr. Gabriel Nahas, Dr. Akira Morishima, Dr. Robert Kolodny, Prof. W. D. M. Paton, Dr. Morton Stenchever and Prof. Cecile Leuchtenberger.

The marihuana-hashish epidemic began as part of the Berkeley uprising of 1964. From there it spread out to the other campuses across the country. Then it spread down into our high schools—then our junior high schools—and now our grade schools. It has also spread upwards into the ranks of our middle class adults, and laterally into the ranks of our blue collar workers.

The charts which you see before you present the major essential facts about the scope of the cannabis epidemic.

As you will see, over a 5-year period, from 1969 to 1973, interceptions of marihuana by Federal agents rose tenfold to a total of 782,000 pounds last year, while hashish seizures over the same period rose twenty-five-fold to a total of 53,300 pounds.

These are staggering figures—all the more staggering when you consider that they do not take into account the many seizures effected by local law enforcement agencies, and when you consider, too, that probably 8 to 10 times as much cannabis gets into the country as is seized or intercepted.

What this means is that the United States last year probably consumed in excess of 8 million pounds of marihuana and 60,000 or more pounds of hashish.

From the scientists who will be testifying at today's hearings we shall be learning something of what this means in terms of the damage done to the bodies and minds of the American people.

It is my hope that today's hearings will mark the beginning of a new period of public awareness.

There has until now been a pervasive impression that the majority of our scientific community think marihuana isn't really too harmful. This feeling has been shared by teenagers and adults, by academicians and newspapermen, by members of the middle class and members of the working class. This is the principal reason for the scope of the present epidemic.

It is my hope that the hearings which we shall be conducting today, tomorrow, and Monday, will set the record straight on this point.

To save time, I would ask the witnesses to rise and be sworn as a group.

Mr. MARTIN. Would the witnesses please come to order and stand behind their name plates?

Senator GURNEY. Will you all raise your right hands please.

Do you swear the testimony you are about to give will be the truth, the whole truth and nothing but the truth, so help you God?

Dr. HEATH. I do.

Dr. NAHAS. I do.

Dr. MORISHIMA. I do.

Dr. KOLODNY. I do.

Dr. PATON. I do.

Dr. STENCHEVER. I do.

Dr. LEUCHTENBERGER. I do.

Senator GURNEY. The first witness will be Dr. Robert Heath. Will you identify yourself for the record, please?

TESTIMONY OF ROBERT G. HEATH, M.D., D.M.SCI.

Dr. HEATH. My name is Dr. Robert Galbraith Heath. I am a psychiatrist and neurologist and chairman of the Department of Psychiatry and Neurology at Tulane University School of Medicine.

My training background is in neurology from the Neurological Institute of New York and in psychiatry from the Pennsylvania Hospital in Philadelphia, and in psychoanalysis from the Psychiatric Institute of Columbia University of New York.

I trained in research in neurophysiology in the laboratories of the College of Physicians and Surgeons at Columbia University of New York. I have been chairman of the Department of Psychiatry and Neurology at Tulane since January of 1949 and during that period, in addition to teaching and practicing psychiatry and neurology, have been involved in research attempting to correlate brain activity with behavioral phenomena and to investigate the basis of a variety of neurological and psychiatric disorders.

Senator GURNEY. Just one or two other questions, Dr. Heath. You

received your medical degree from the University of Pittsburgh in 1937, is that correct?

Dr. HEATH. In 1938.

Senator GURNEY. 1938.

Dr. HEATH. That is correct.

Senator GURNEY. And you have been professor and chairman of the Department of Psychiatry and Neurology at Tulane University School of Medicine in New Orleans since 1949?

Dr. HEATH. That is correct.

Senator GURNEY. You have been a member of the International Board, Advisory Board, of the International Journal of Neuropsychiatry since 1959, is that correct? You are a member of the Ad Hoc Advisory Committee on Schizophrenia of the National Institute of Mental Health, is that correct?

Dr. HEATH. Correct.

Senator GURNEY. Did you, in 1972, receive the Gold Medal Award of the Society of Biological Psychiatry for pioneer research in the field?

Dr. HEATH. Correct.

Senator GURNEY. And are you the author of several books in the field of psychiatry and psychology?

Dr. HEATH. That is right.

Senator GURNEY. And the author and co-author of approximately 250 scientific papers?

Dr. HEATH. That is correct.

Senator GURNEY. Is there any other information that you feel the committee ought to have about your qualifications as an expert in this field?

Dr. HEATH. I can't think of any more, Mr. Gurney.

Senator GURNEY. Will you proceed with your statement then, Dr. Heath.

Dr. HEATH. Senator Gurney and members of the committee, we have been involved in research, as I have indicated here, to determine if marihuana or the principal active ingredient, tetrahydrocannabinol does, indeed, induce objective changes in brain activity and in brain structure; whether or not marihuana smoking produces severe behavioral pathology or brain damage, or both. This is an issue that is still confused and unsettled today. Several clinical studies have been reported in the scientific literature which suggest that frequent and prolonged smoking of marihuana has deleterious effects on behavior and the brain. Other authorities have insisted that marihuana is an innocuous agent—that reports of its deleterious effects have failed to take into account the influence of several variables, such as the smoker's use of other drugs or his preexisting behavioral or brain abnormalities.

The most notable and consistent clinical changes that have been reported in heavy marihuana smokers include apathy approaching indolence, lack of motivation often referred to as an emotional state, reduced interest in socializing, and attraction to intense sensory stimuli—they like to listen to loud music, floating lights, and so on. Less frequent are reports of overt psychotic behavior characterized

by losing contact with reality, having hallucinations and so forth, and the induction of dyskinesias—abnormal muscle movements.

In the Tulane laboratories, data gathered from a small number of uncontrollable epileptic patients who were undergoing brain surgery for their epilepsy, have revealed consistent alterations in function of specific deep brain sites. Techniques involved in the treatment of their epilepsy were rather unique. Electrodes were implanted into specific structures deep in the brain as well as over the surface. With these techniques we were able to obtain information on brain function that could not be obtained with the more conventional recording techniques. Some of the patients involved were chronic marihuana smokers. During the course of their treatment, we permitted them to smoke marihuana cigarettes while recordings were being made, with these special techniques, from otherwise unavailable brain sites. The deep brain sites affected by the smoking were those where we had, over the years, made correlations between brain activity and alerting, awareness, and feelings of pleasure.

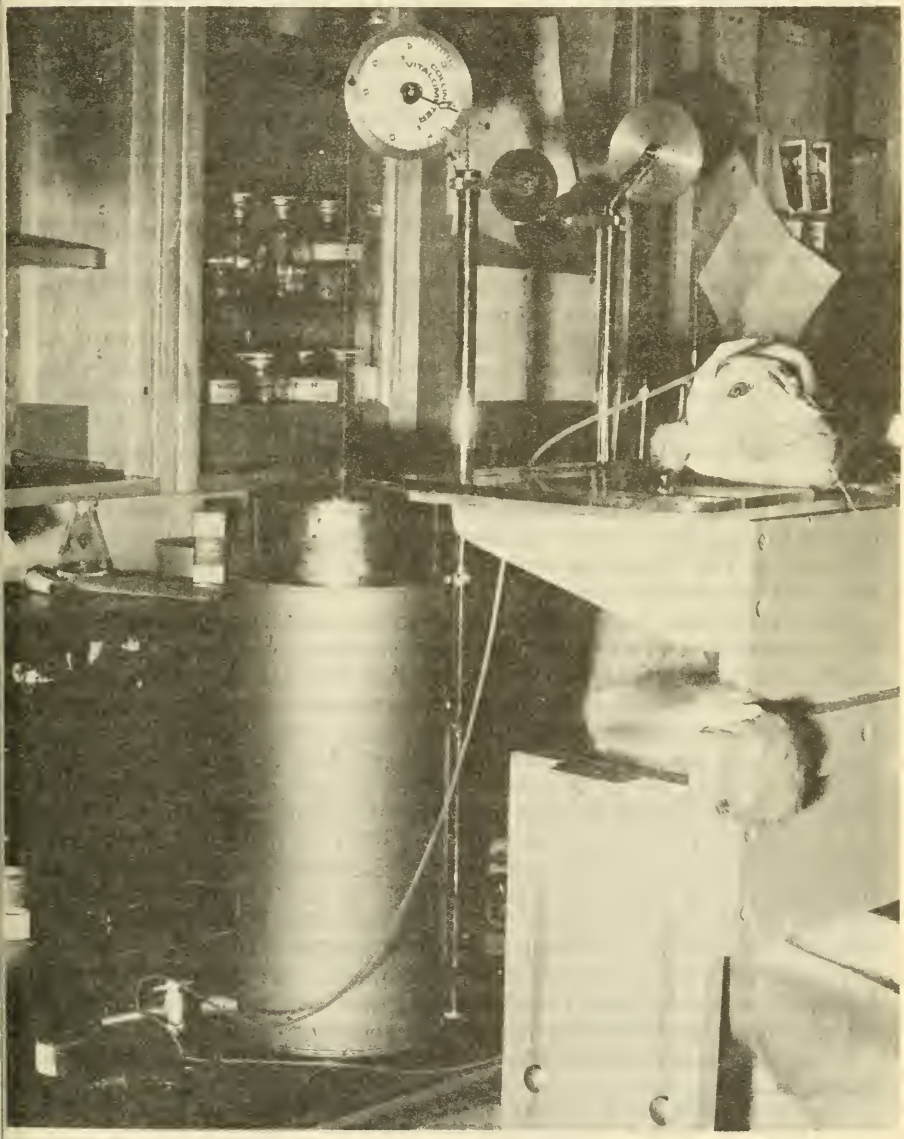
One particular region of the brain that will be referred to frequently, is the septal region. Activity in this region has been consistently correlated with emotionality and feelings of pleasure. In schizophrenic patients, this region functions abnormally and this accounts for the lack of pleasure responsivity in the schizophrenic. Because it is connected with the sensory relay nuclei, the systems for perception of various sensations such as sound, light, touch, and movement, its abnormal functioning affects these other systems, and this can account for the disturbances of perception such as the hallucinations that psychotic patients experience.

This region was affected when these patients smoked marihuana. That was a preliminary study and on the basis of it, we elected to do more intense study where we could control all of the variables that I previously mentioned. This degree of control is possible, of course, only in experiments with animals and could not be done with human patients. By using animals we were able to eliminate the variables—and I repeat them—the use of other drugs and a predisposition to mental or emotional illness.

The dosage of marihuana smoked in these monkeys was rigidly controlled and precise methods were applied for studying brain activity in the animals; parameters for study which could not, of course, be used routinely for studying marihuana in humans since we implanted electrodes into the brain. The question for which we sought an answer was: "Does marihuana induce significant irreversible effects on behavior and on brain function, or on the structure of the brain?" This report is a preliminary survey of the data collected from our first long-term investigation, now nearing completion, of the effects of marihuana in rhesus monkeys.

Several cannabis preparations, all obtained from the Narcotic Addict Rehabilitation Branch of the National Institute of Mental Health, were used for smoking: marihuana with a high content of delta–9 THC, tetrahydrocannabinol; inactive marihuana, devoid of active cannabis compounds; and for intravenous injection, pure delta–9 THC, that thought to be the most important active ingredient of marihuana.

For smoking the monkeys with marihuana, a special apparatus, designed in our laboratories and pictured in figure 1, was employed. If you have any questions, Senator, or members of the committee, please interrupt me but it is probably better to explain as I go along. This is a device by means of which we could assure the delivery of an accurate dose. The marihuana to be smoked was assayed to quantitate the active ingredients, then an exact amount was weighed out based on a dosage commensurate with the known dosage of marihuana that people use, the same amount per unit of body weight. This was put into the pipe as shown here—figure 1—and attached



to a respirometer. The smoke was pulled into the respirometer by an electric motor and that smoke accumulated in the respirometer was then delivered into the monkey's nasopharynx through this tubing [photograph], at a rate commensurate with the rate of inhalation of human smoking.

Mr. SOURWINE. Mr. Chairman, may I ask it be the order of the chairman that any photographs, charts, tables produced by the witness may go into the record.

Senator GURNEY. Yes, it is so ordered. They will be made a part of the record.

Dr. HEATH. Delta–9 THC, the presumed important active component of marihuana, at a dose relative to the quantity of this ingredient absorbed from the smoked marihuana, was given intravenously through an indwelling intravenous cannula. I won't detail the methods of preparation. Since a high percentage of the active ingredient is lost in smoking, the intravenous dose of the delta–9 THC was determined in accordance with the animal's response. The dose was approximately 18 percent of the amount of THC contained in the smoked marihuana.

For control smoking with inactive marihuana, the amount of starting material was equated with the amount of marihuana and the total amount of marihuana was equated with the amount of the raw product in the active preparations.

Ten rhesus monkeys were used in these experiments, some prepared with deep and surface brain electrodes and some which were unoperated to control for the variable of the effects of implanted electrodes. There are sockets that can be plugged into and the monkey has some 30 leads in various predetermined brain sites accurately implanted by a special device we use.

Those monkeys that were operated were allowed to rest for at least 2 weeks after surgery to assure they were fully recovered from implanting the electrodes and until their recordings from all brain sites had returned to normal.

The procedures used in this investigation enabled us to learn both the immediate—acute—and long-term—chronic—effects of marihuana and delta–9 THC on brain function and behavior of monkeys. To determine the effects of long-term exposure, one group of monkeys, which corresponded with human heavy smokers of hashish, a concentrated cannabis preparation, was smoked three times per day, 5 days a week, for 6 months; another group which corresponded with moderate human hashish smokers was smoked two times a week for 6 months. The amount of delta–9 THC contained in the material employed for the moderate hashish smoking corresponded closely with the weekly dose levels that is consumed by the average marihuana smoker in the United States.[1] Two monkeys were given delta–9 THC once each day, 5 days a week over the 6-month period.

I shall talk about the effects of marihuana and delta–9 first as a summary statement and I will then go into detail on each aspect of the experiments—the acute aspect and the chronic aspect.

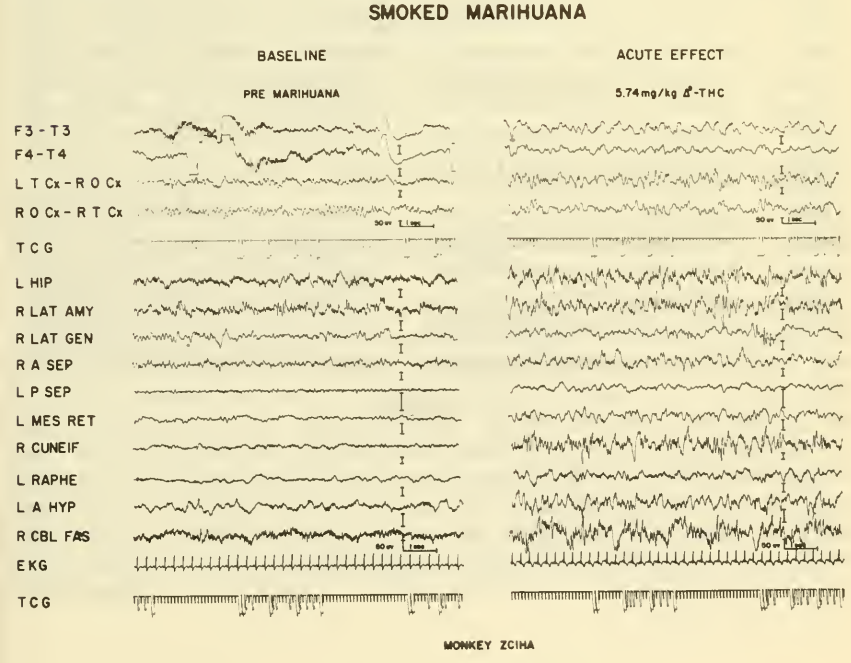
With exposure to the smoke of active marihuana, all monkeys de-

[1] Dose levels correspond to those in clinical study by Tennant, F. S., and Groesbeck, C. J. Psychiatric effects of hashish. *Arch. Gen. Psychiat. 27:* 133–136, 1972.

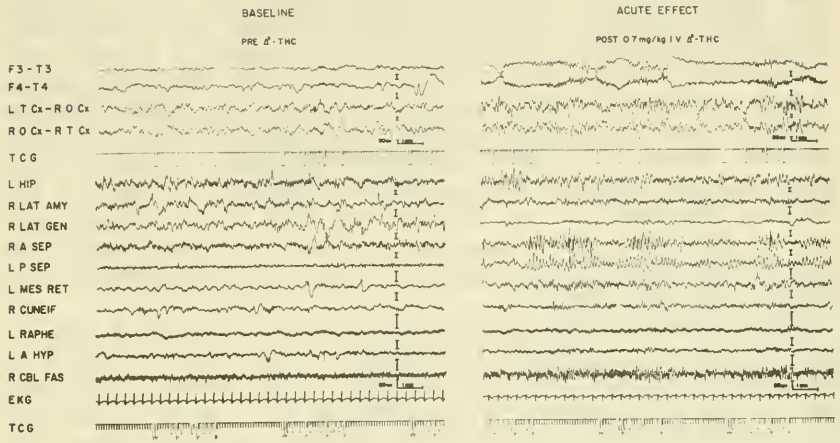
veloped acute [immediate] distinct alterations in behavior and those with depth electrodes showed significant alterations in brain recordings. Similarly, with intravenous administration of delta–9 THC, the monkeys developed acute [immediate] changes in behavior and in brain-wave activity from some deep brain sites. With the passage of time, these monkeys; that is, those exposed to the smoke of active marihuana and those given injections of delta–9 THC at regular intervals, developed chronic [persistent] changes in brain activity. These changes outlasted the immediate period of an hour or two after the conclusion of the smoking and were found to be present up to 5 days later. Those monkeys exposed to inactive marihuana, that is with the active ingredient, THC removed, showed neither acute nor chronic effects.

I'll now describe the acute effects in detail. For this I refer to figure 2. The acute effects of marihuana were most pronounced in the monkeys during the early exposures to the smoke and became less evident with passage of time, that is, with repeated smoking. The immediate behavioral effect was reduced awareness. They were what is generally referred to as "stoned" and responded less to all forms of sensory stimuli, tending to stare blankly into space. You could stick them with pins or put your finger in their mouths without concern, and this is impossible with normal rhesus monkeys as they are rather hostile animals.

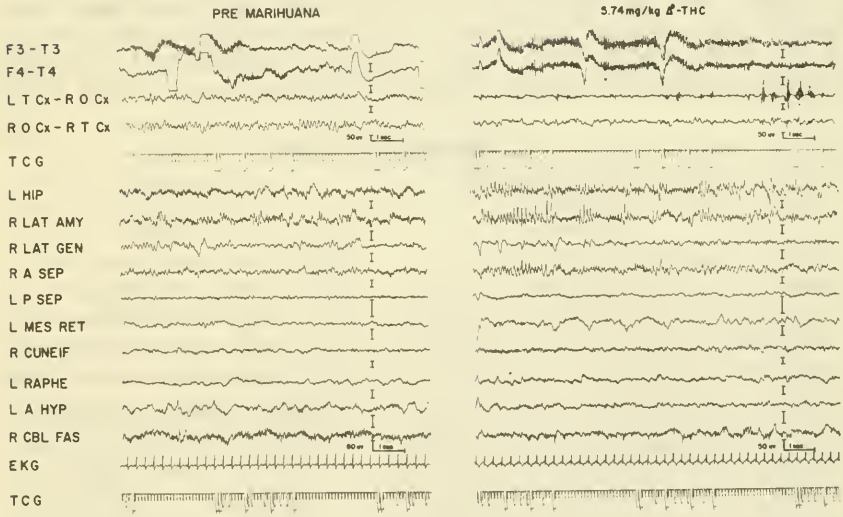
Four of the six monkeys in this group were prepared with depth electrodes and distinct alterations were seen in recordings from specific deep sites of their brains—the most consistent changes occuring in the septal region, hippocampus and amygdala. If you look at figure 2, the sixth channel down is the hippocampus, labeled HIP.



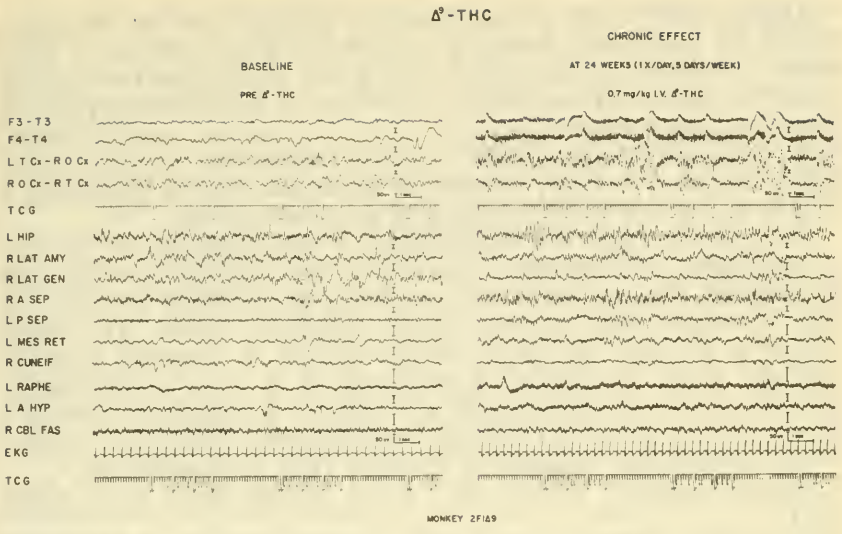
Δ^9-THC



CHRONIC EFFECT



MONKEY ZCHA



KEY TO BRAIN WAVE TESTS

1. F3–T3—Frontal Cortex to Temporal Cortex.
2. F4–T4—Frontal Cortex to Temporal Cortex.
3. L T Cx–R O Cx—Left Temporal Cortex to Right Occipital Cortex.
4. R O Cx–R T Cx—Right Occipital Cortex to Right Temporal Cortex.
5. T C G—Time Code Generator (for computer).
6. L HIP—Left Hippocampus.
7. R LAT AMY—Right Lateral Amygdala.
8. R LAT GEN—Right Lateral Geniculate.
9. R A SEP—Right Anterior Septal.
10. L P SEP—Left Posterior Septal.
11. L MES RET—Left Mesencephalic Reticulum.
12. R CUNEIF—Right Cuneiformis Nucleus.
13. L RAPHE—Left Raphe Nucleus.
14. L A HYP—Left Anterior Hypothalamus.
15. R CBL FAS—Right Ceribellum Fastigius Nucleus.
16. E K G—Electrocardiogram—Pulse.
17. T C G—Time Code Generator (for computer).

Senator GURNEY. Will you identify, Doctor, which chart you are reading from now?

Dr. HEATH. This is figure 2. It is headed Smoked Marihuana Baseline on the left, Acute Effect on the right.

Senator GURNEY. I am sorry.

Dr. HEATH. If you will look at the amygdala and the hippocampus channels, you see the most dramatic changes. There are changes in other sites too, but of a much lesser magnitude. Let me add that this is a very inadequate way of presenting this data but it is the only way I can under the circumstances. When we do a recording we record for at least 20 minutes and usually up to approximately an hour and then we look at the entire record. The record fluctuates—one time the change will be at one site and then as you go on they will shift to another site and so on, and the only way you can get a complete and comprehensive picture is to look at the entire recording.

Another way to get a comprehensive picture is to use videotape and if the committee wishes, I can provide them. We use a split-screen videotape showing the animal in one corner and the ongoing record on the rest of the screen. As you see the animal displaying the behavioral effect from marihuana smoke, you see the changes coming on in his brain recording. That is really the clearest way of presenting it. But here, as I say, we have an inadequate way of presenting it as it is just a very brief sampling of an entire record.

You can see under the acute effects of marihuana smoke changes in many sites. The amygdala, septal and hippocampus show the most pronounced changes and these are brain areas where activity has been correlated with various specific emotional states. The septal region is the site for pleasure—stimulating it activates pleasure feelings. When its activity is impaired, as it is in schizophrenia, you have a lack of pleasure and a reduction of awareness towards a sleepy, dreamy state. The changes we found with marihuana, in some ways, resemble the changes we recorded from schizophrenics.

Senator GURNEY. Which one are we talking about now—which line?

Dr. HEATH. This is the septal recording—labeled SEP—the eighth and ninth channels. As I say, this is a very brief sampling and with ongoing records there are changes, but of a lesser degree, in other sites. The changes are increases in amplitude, that is, the height, and in frequency, that is, the length of the wave.

Senator GURNEY. And for the record, I am asking, I understand but I am asking these questions so that we can set the record straight. The charts on the left are the normal lines before the marihuana was smoked and the lines on the right are the lines after the effects of the smoking marihuana, is that correct?

Dr. HEATH. That is correct. But I wish to point out that the sites most profoundly affected were those that had to do with emotionality. To repeat, the septal region, when it is acutely activated as with an electrical stimulus or with chemicals, induces pleasure. When you spontaneously feel strong pleasure, it produces a change in the recordings. Contrariwise, when activity in the septal region is impaired, then there is a reduction in pleasure responsivity.

With the acute smoking of marihuana you do get a pleasure response in humans and you find this reflected in their recordings. In contrast and most significant, however, is the finding that with chronic usage you begin to get recording changes indicating that the area is impaired in its function and that is associated with a reduction in pleasure responsivity, a lessening of motivation and a reduction in awareness. That, then, is the acute effect of smoking marihuana.

I will reiterate again that the sites that had to do with emotionality are directly connected with the relay nuclei in the brain for sensory perception. This is a possible physical explanation for the finding that when emotionality is grossly impaired (whether it be in a schizophrenic or as a result of an intoxicating drug) it affects the septal region, hippocampus and amygdala and is often accompanied by hallucinations and the other altered perceptions which these people experience.

Mr. SOURWINE. Mr. Chairman, may I ask one question which I think will help the record? Doctor, would it be possible for you to tell us as you did with respect to the septal region what controls or reactions are specifically associated with the hippocampus and the amygdala?

Dr. HEATH. That constitutes approximately 25 years of work and I was almost hoping you wouldn't get into that. The controls have been a lengthy background of experiments with hundreds of monkeys and with a total of some 60 or 70 human subjects in whom we have implanted electrodes into these sites in a treatment program for otherwise untreatable neurological diseases and some psychiatric disorders. We have techniques by which we implant electrodes into specific sites in humans for treatment, and they remain in place for periods up to a year or more. During this period of study for diagnosis and treatment, we have been able, through a variety of techniques, to establish meaningful correlations between brain activity and behavior. For example, we obtained recordings when the patient was in different mood states and thereby establish correlations between brain activity at specific sites and varying mood states. We stimulated a number of specific deep sites in the brain and we were then able to establish how that alters behavior. We have administered drugs which modify behavior and further established the brain changes associated with those behavioral alterations. This, at best, only briefly summarizes the extensive background work that we have compiled over the years against which the present experiments are being conducted.

Mr. SOURWINE. Is it fair to say, sir, that the question I asked cannot be simply answered as in the case of the septal?

Dr. HEATH. Yes, it cannot be simply answered. It would take a lengthy dissertation and I don't believe we can get into that here. We do, however, have these documented on film. The only way to know what is going on in the mind is to have someone that can talk to you. As such, animal experiments are limited. I think that is a general statement pertinent to the information you are seeking. Shall I proceed?

It is important to point out that no consistent or notable changes were seen in the scalp recordings of these four monkeys and none were seen in the conventional scalp EEG (electroencephalogram) recordings obtained from the two unoperated monkeys, and no consistent changes on scalp EEGs have been reported in human marihuana smokers. I am pointing this out because usually the only technique that can be applied to human subjects is the conventional scalp EEG.

These acute behavioral changes and recording changes subsided within 1 hour after exposure to the smoke.

No visible changes in behavior or acute changes in brain recordings were obtained in monkeys which were exposed to the smoke of inactive marihuana, suggesting that what we found was directly related to the active ingredients in the marihuana. Further evidence was the active ingredient, delta–9 THC administered intravenously once a day, 5 days a week, which consistently induced distinct and

immediate changes in behavior and recordings in the two implanted monkeys. These effects were more pronounced than those obtained with the smoke of active marihuana. The two monkeys were more reduced in awareness and the recording changes, while occurring in the same brain structures as in the monkeys which were smoked, were more profound. The changes consisted of the development of frequent high-amplitude spiking, most pronounced and focal in the septal region.

This is the brain site that is most profoundly affected in schizophrenia. Changes with delta–9 THC were more focal in the septal region and the magnitude of the change was somewhat greater than with the smoked marihuana. It appears, then, that this produces a more potent effect on this pleasure site; first turning it on and then with overdosage and continued usage, it seems to destroy the activity of this site; the latter state being similar to that which we have in some psychotic behavior. These recordings resembled those we have previously obtained from the septal region of severely disturbed psychotic patients.

The chronic effects, which I think may be most pertinent to these hearings, were the most impressive to us. Those monkeys prepared with depth electrodes which were exposed regularly to active marihuana (heavily smoked—three times per day, 5 days a week; moderately smoked—two times a week), over a period of time began to show evidence of irreversible alterations in brain function about 3 months after onset of the experiment. The precise brain regions affected were, again, the septal region, hippocampus and amygdala. These chronic effects were manifested by the recording changes which outlasted the acute effects of the smoke—that is, they persisted through the weekends when the monkeys were not exposed to smoke for 2 days. They were present on the Monday morning following and we have let them go as long as 5 days and these effects were still present. It appears that they are persistent, but to say that they were permanent, requires the passage of more time and further investigation. Our previous experience with similar situations would lead us to assume that this chronic smoking of marihuana has probably produced irreversible changes in brain function.

It was interesting to us that these distinct and persistent brain alterations were temporarily corrected, being replaced by a different type of altered brain activity, when the animals were again exposed to the marihuana smoke. This phenomenon suggested that the marihuana had induced permanent changes of a type that could be temporarily alleviated by acute exposure, seemingly paralleling the well-known pattern of the drug-dependent person who gains temporary relief from deprivation by taking more of the drug.

In two unoperated monkeys which were heavily smoked with active marihuana, only scalp recordings could be obtained; no changes were reflected in these conventional recordings. I again cite the impotence of physiological techniques of only scalp recordings used routinely on human subjects. That is the reason, of course, that people report often that there are no changes in brain functions.

They use a scalp EEG, a technique which is unable to pick up these changes.

Chronic exposure to inactive marihuana smoke did not produce notable behavioral or recording alterations in the monkeys.

Persistent recording changes from specific deep brain sites, the septal region, hippocampus and amygdala, appeared in the two monkeys to which delta–9 THC was intravenously administered 5 days a week in 2 to 3 months after the study began. As with the monkeys exposed to marihuana smoke, these changes persisted over the weekends. You will note in figure 5 that there is a high amplitude spiking in the sixth channel indicating a change in the hippocampal function.

Also, in the septal leads (9th and 10th channels), you will find high amplitude sharp spiking and this has a great deal of significance. This is what we refer to as "epileptiform activity" and indicates that there is damage to that site or the cells in the vicinity of that recording electrode.

With regard to physical complications in this experiment, two monkeys out of the 10 died during the course of these studies. Their recording and behavioral data are included in the effects cited herein. One monkey died 3½ months after onset of the experiment and the other animal died after 5½ months after the onset. One had implanted electrodes and the other was unoperated. Both were in the heavily smoked active marihuana group (chronic exposure) and both died of respiratory complications.

The brains of these two animals have been studied histopathologically and the preliminary report indicates minimal structural alteration of cells in the septal region of the brain.

Our protocol requires us to continue to study the behavioral and recording changes in the surviving monkeys for 1 month beyond the drug exposure period of 6 months. At that point, the monkeys will be sacrificed and their brains will be carefully perused and prepared for study by electron and light microscopy to yield more finite data about structural changes that may have been induced in association with the consistent physiological alterations that I have described.

Regarding behavioral effects, the behavioral data concerned with long-term effects of marihuana smoking and intravenous delta–9 THC have not been sufficiently analyzed to report them at this time. There are, however, behavioral changes which have been documented which are not solely due to the acute effects of the drug.

In summary of this experiment I am reporting to you that the smoke of active marihuana, that is, with a high content of delta–9 THC, induced in the rhesus monkeys, consistent and distinct changes in recordings from specific deep brain sites in association with behavioral alterations.

(2) When the monkeys were regularly exposed to these drugs, at both moderate and heavy dose levels, persistent—perhaps irreversible—alterations developed in brain function at specific deep sites where recording activity has been correlated with emotional responsivity, alerting and sensory perception.

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(3) Heavy smoking of active marihuana induced respiratory complications which proved lethal to two monkeys after 3½ to 5½ months.

(4) Preliminary histopathological data suggest that structural alteration of cells at focal brain sites may be associated with the persisting physiological changes.

Incidentally, the sites in the brain where we have gotten these most pronounced and persistent changes are in areas which show on pneumoencephalograms. Damage at these sites would correspond with the findings of Campbell, et al., published in Lancet in 1972. Their studies were with human subjects and adolescents who were smoking marihuana for a very long period of time who showed some behavioral symptoms and had enlarged lateral ventricles.

Senator GURNEY. Thank you, Dr. Heath. Members of the panel, I have a vote in the Senate now and I am going to have to recess the subcommittee briefly while I go and vote. The subcommittee is recessed at the call of the Chair.

[Short recess.]

Senator GURNEY. The subcommittee will come to order. First of all, I want to apologize to the panel here. We have a very controversial bill on the Senate floor, the issue known as busing, so I am going to be back and forth quite a bit in the morning.

Dr. Heath, I am going to ask a few general questions and then the counsel will ask more questions about the more technical aspects of your testimony. First of all, how long have you been doing research on marihuana?

Dr. HEATH. About 4 years.

Senator GURNEY. Is it your conclusion, Dr. Heath, from the research you have done in these 4 years that marihuana is a dangerous drug?

Dr. HEATH. When I first began to work with marihuana I was much in keeping with the ideas that were prevalent in the scientific arena at that time that marihuana seemed to be a relatively innocuous agent. It produced relaxation and no one had established that it produced any significant damage, nor that it was strictly addictive. But as I have gone on with the experiments observing the effects in humans, both clinically and as part of the research program, I began to feel that this is a very harmful drug. This drug seems to produce real and significant damage, and my data, I believe, substantiates the fact that this is a drug which has strongly deleterious effects with probable destructive effects on the brain in heavy users.

I think most of my colleagues, at least the ones that I have daily contact with in the medical school and particularly those who are in charge of the psychiatric or mental health section of the student health clinic at Tulane, have become more and more concerned with the marihuana problem, as students using it are showing distinct, often severe and lasting effects.

So, in summary, as time has gone on, and I have become personally more acquainted with and interested in the effects of marihuana, both clinically and experimentally, I have come to feel increasingly that this is a dangerous drug.

Senator GURNEY. You mentioned that you were concerned about the use of marihuana among the students at Tulane University. I, of course, don't intend to single out Tulane—it is a typical American university like the others everywhere—but would you say that marihuana use on your campus is fairly widespread among the students?

Dr. HEATH. Yes, we have done surveys from time to time, and I think they are fairly accurate. In the surveys students had no reason not to answer the questions candidly and it is in quite wide usage. I'm sure this is true in other campuses as well.

Senator GURNEY. What percentage of usage among the students did your surveys show?

Dr. HEATH. Well, surveys have varied, depending what your criteria are. In other words, if you include the occasional experimental user, the percentage is much higher than if you only consider those that use it very frequently. There are gradations—those who smoke daily, those who use it several times a week, and those who smoke on the weekends to those who have experimented only once or twice. I would say, considering only those who have used it to a significant extent, that the statistics range as high as 30 to 40 percent.

Senator GURNEY. What do you call a fairly consistent usage—how many?

Dr. HEATH. Two or three times a week.

Senator GURNEY. Now this is a marihuana cigarette, I presume?

Dr. HEATH. Correct. I would consider two to three marihuana cigarettes per week and doing it on a regular basis to be significant.

Senator GURNEY. And it is your opinion from the result of your research that the persistent use of marihuana two or three times a week regularly does produce permanent brain damage?

Dr. HEATH. It would seem unlikely that marihuana of low potency smoke of two or three times a week would produce brain damage. We were using considerably higher dosage in our experiments. Moderate smokers—moderate being based on hashish consumption—corresponds to the upper levels of social consumption that would amount to smoking considerably more than two or three marihuana cigarettes of the potency level prevalent on our campus. The dose range would be about the level that would be consumed if a person were smoking three average marihuana cigarettes per day. We are talking about dosage on a per kilogram level between our monkeys and our humans—not total dosage, of course. In the future, if the funds are provided, we will smoke monkeys at a lower dose level commensurate with the amount of active ingredient that is consumed by an individual smoking three to five cigarettes per week. This would mean repeating the entire study at this dose level and would involve considerable additional expense—but until we do this I will not be able to answer with precision the question you raised.

Senator GURNEY. Would you care to offer an opinion about the persistent use of marihuana by your students, if that would produce brain damage?

Dr. HEATH. We have numerous instances in which the students using marihuana have gotten into difficulty one way or another. But there are, of course, many variables in the life of students and this

is what makes clinical data in some instances questionable. But as you see a number of patients where smoking marihuana is in the foreground of the clinical picture, you do begin to feel that this is an agent which has harmful effects, and one which reduces the effective capability of many students in both their personal life relationships and their academic performances. Speaking as a clinician, without being able to back it with precise hard data such as we have in animals, it seems probable that the continued use of marihuana is reducing the potential ceiling level of functioning of a number of these students, both emotionally and academically.

Senator GURNEY. You mentioned about 4 years ago when you began this study you felt that marihuana was, as I recall, not a harmful drug, a rather innocuous drug. But you have changed your opinion on that?

Is it also true that this is a prevailing opinion among a widespread portion of our population today—that marihuana is an innocuous and is not a harmful drug?

Dr. HEATH. Yes. I see the point you are making and I think it accurately reflects the prevailing attitude amongst younger members of our society, both high school and college students. If you speak with them they quote certain authorities and opinions from members of their own group to the effect that this drug is innocuous.

Senator GURNEY. Another question that I think is important. There is a prevailing opinion, I think, certainly among the users—the young people and the adults too, so far as that is concerned—that marihuana can be equated to alcohol as a drug; that marihuana really isn't any more harmful than alcohol. Would you care to express your opinion on that?

Dr. HEATH. Yes, I think I can express that even more firmly because it can be backed with hard data from our animal studies. If I may, I would just like to state that the probable reason so many believe that marihuana is innocuous is because there really has not been any significant amount of hard data collected until recently to determine whether it does or does not produce damaging effects on the human, particularly on the brain.

I think our data are some of the first real objective data that have shown that marihuana does produce persistent effects, at least in brain function. Until this sort of data had been collected people were going on hearsay. I think it is important to separate what is soft or impressionistic opinion from factual data, and the factual data hasn't all come in yet. The investigators you have gathered here today have all been in the process of collecting some hard data.

Senator GURNEY. Realizing then that the data are not complete, because we do want to be careful in making conclusions and statements, but from your own studies, I take it, your opinion is that marihuana is a far more dangerous drug than alcohol?

Dr. HEATH. I believe that is correct. We have used alcohol as a control in our studies, both with human patients and with the animals. I am perplexed as to why this analogy was made between marihuana and alcohol since we have gathered more information,

except that on a social, clinical basis both produce relaxation and a feeling of euphoria. But when you begin to study brain activity in relationship to these compounds they are drastically different. Alcohol does not produce these profound specific recording changes that I have been showing you as a result of marihuana and the active ingredient delta–9 THC. It produces some diffuse, rather minor alterations, that you would expect if you spontaneously were somewhat more relaxed.

Alcohol does not get in there and directly and profoundly affect brain function as the cannabis preparations do. They have a strikingly different physiological effect on the brain. Of course, alcohol does affect the liver and it has been shown objectively with many recent experiments that it ultimately can affect the brain, but you can use alcohol for a long period of time without producing any sort of persistent damage. People might drink rather heavily for 25 or 30 years and never get into serious trouble so far as alterations in their brain is concerned. But with marihuana, as the facts are beginning to accumulate, it seems as though you have to use it only for a relatively short time in moderate to heavy use before persistent behavioral effects along with other evidence of brain damage begin to develop. As I have said, these animal data are hard data. As data accumulates they are beginning to confirm what many of us have suspected from clinical experience with marihuana users; namely, that this produces distinctive and irreversible changes in the brain.

Senator Gurney. One final question, Dr. Heath. Do you think that the use of marihuana should be legalized?

Dr. Heath. You know, I think that is a little bit out of my ball park and into yours.

Senator Gurney. All right.

Dr. Heath. I think it is my job to collect information for you to use in making that decision.

Senator Gurney. I guess so.

Dr. Heath. And I would rather avoid commenting on it.

Senator Gurney. You have a good point. Counsel will have questions now to ask you—Mr. Martin.

Mr. Martin. I have a suggestion to make, Mr. Chairman. So that the record will be more comprehensible for the lay reader, I would like to suggest that Dr. Heath provide us. if it isn't too much trouble, with a diagram showing the location of the segments of the brain about which he has been talking today, and a brief description of the major functions controlled by these segments. Would that be possible, Dr. Heath?

Dr. Heath. Yes, that could be produced.

Senator Gurney. The diagram will be included as a part of the record.

[The diagram referred to follows:]

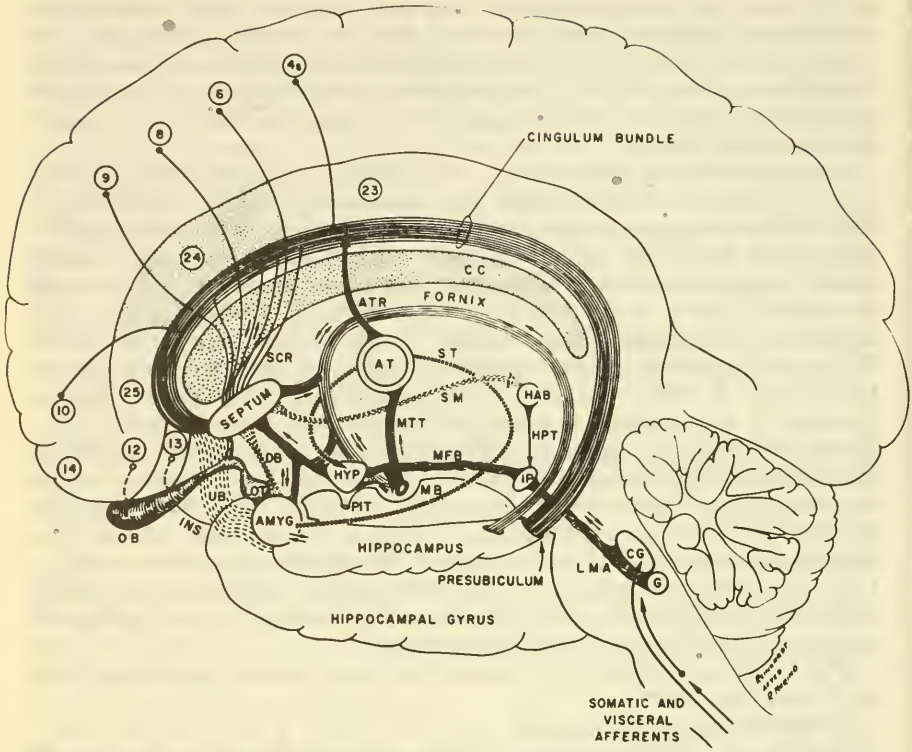

FIG. 1. Schema of the limbic system. OB—olfactory bulb; LOT—lateral olfactory striae; INS—insula; UB—uncinate bundle; DB—diagonal band of broca; AMYG—amygdala; SCR—subcallosal radiations; HYP—hypothalamus; AT—anterior thalamus; MB—mammillary body; MTT—mammillothalamic trace (Vicq D'Azyr's Tract); ATR—anterior thalamic radiations; ST—stria terminalis; HAB—habenula; MFB—medial forebrain bundle; SM—stria medullaris; HPT—habenulointerpeduncular tract (fasciculus retroflexus of Meynert); IP—interpeduncular nucleus; LMA—limbic midbrain area of nauta; G—nucleus of Gudden; CG—central gray; CC—corpus callosum.

Mr. MARTIN. The EEG charts that you have shown us, Dr. Heath—would it be accurate to describe them as a quantitative reading of aberration from the normal in the brains of monkeys and humans who have been exposed to marihuana? Does a more violent aberration of the brain wave pattern from the normal pattern mean that the brain has been more severely affected?

Dr. HEATH. Yes, in general, that is true. In regard to your major question about quantitating, yes, they can to some extent be quantitated and we have been quantitating those.

If you will note on those records there are two channels labeled the TCG, time code generator. We can put this physiological data on tape, and then we can put it into the computer for a quantitative analysis of the changes that have occurred in terms of the amplitude

changes and the frequency changes, which are the basic important constituents of an EEG record.

Mr. MARTIN. You spoke about the parallel work you conducted with alcohol in monkeys and humans, Dr. Heath. Would it be possible to provide us for the record with a set of parallel EEG charts for alcohol, with a commentary on the difference between the marihuana and alcohol?

Dr. HEATH. Yes. As a matter of fact I have published articles on that comparison. One was on humans, in the Archives of General Psychiatry, I believe, in the early summer of 1972. And the other was on monkeys where alcohol was used as a control substance, and that was published in the Journal of Neuropharmacology in 1973—I will send you reprints of both if that is satisfactory.

Senator GURNEY. That is, and these will be included in the record as well.

[The documents referred to may be found in the appendix, pp. 349, 356.]

Mr. MARTIN. Do the aberrations from the normal appear to be more marked in any one segment of the brain than in other segments, and, if this is the case, what would you say this implies?

Dr. HEATH. Yes. The sites that are most profoundly affected are the septal region, hippocampus, and amygdala and this is where the lasting effects have been occurring.

The septal is part of the deep rostral forebrain, the front part of the brain in depth and, as I indicated, this is the site where we have been able to localize pleasure responsiveness. This is the center of our physiological system for pleasure. Whenever you spontaneously feel pleasure this side fires off, and if you stimulate it, intense feelings of pleasure are induced. When you have diseases such as schizophrenia where pleasure is impaired, this region is functioning abnormally. The fact that this drug, marihuana, initially turns it on and activates it like an electrical stimulus, is the reason that people use the drug. That is the fundamental attraction of addictive drugs—they make you feel good.

Ultimately, of course, since they are squeezing out the essential chemical constituents of this physiological system, it becomes exhausted; you then need to take increasing amounts of the drug, until the system is completely exhausted and the drug no longer induces an effect. The drugs aren't putting in anything. They're just squeezing out what you have there already. Ultimately, the cells become depleted and can't respond.

Mr. MARTIN. You mentioned schizophrenia. Is it accurate—I have heard this, I am not sure that it is so—that you have a similarity between the brain wave patterns of marihuana smokers and schizophrenics?

Dr. HEATH. In some of them that is correct. In particular, in these animals that have been chronically exposed, we are beginning to see changes of the sort we see in the psychotic schizophrenic patient. This septal region recording abnormality is seen with any form of psychotic behavior—schizophrenia or other brain pathologies causing psychosis. For example, if a brain tumor grows there and knocks out these cells you get psychotic too.

Mr. MARTIN. Is the motivational factor—is this controlled by the hippocampus or what segment?

Dr. HEATH. The septal region, hippocampus and amygdala, which are integral parts and richly interconnected, are parts of this motivational system. But the septal region is much more tied in with pleasure and thus with motivation. We do things because we get a reward. Thus, motivation is tied in with pleasure.

Mr. MARTIN. The aberration from the normal which you found in the segments of the brain associated with motivation—could these aberrations have anything to do with the so-called amotivational syndrome?

Dr. HEATH. Yes, I think this is the correlation. This is the pleasure system and if its function becomes impaired then you lose your motivation. There is a physiological basis for motivation.

Mr. MARTIN. One final question. One of our witnesses last Thursday was Dr. Harvey Powelson of California. Dr. Powelson served as director of the Psychiatric Division of the Student Health Service at Berkeley from 1964 to 1972, and he saw the beginnings of the epidemic, and he saw it burgeon, and then he saw it take over the campus. And he changed his mind as a result of this exposure, as a result of the exposure to hundreds—literally hundreds—of students who had gone on marihuana and hashish and had suffered irreparable damage in his opinion, as a result of this. He told us that he was convinced of the existence of irreversible brain damage and that it was produced in a relatively short time, as you suggest is a possibility.

He related the history of a brilliant student of mathematics who had abandoned his studies when he embarked on a heavy cannabis binge and then about 2 years later he decided to pull himself together and come back. So he laid off for a long time, went back to school, became functional—but he just couldn't do the complex mathematical calculations he was able to do before, even a year later. Does this correspond to anything in your experience?

Dr. HEATH. It very closely parallels my own experience both clinically and in my research. I haven't seen the numbers of patients who are marihuana smokers that Dr. Powelson has. He was in a very unusual position. We have a much smaller student body and I have seen some of the students personally. But our experience parallels his. You describe another very interesting phenomenon which I would like to comment on, and that is that when a person stops using the drug, they do show some improvement. They do not, however, get back to their baseline level of functioning. This is true with any insult to the nervous system; whether it be a stroke, a trauma or a hit on the head, the initial effects are much greater that the long-term effects. When you get an insult to the nervous system, even though the immediate effects are very profound, there is a tendency for it to clear up but only partially. There is always some permanent residual effects which hangs on and I think this is what Dr. Powelson described. Much of the immediate toxic effects clear up when you stop smoking but the consequences of that toxin having been there for a long time may permanently damage some cells which then can't recover.

Mr. MARTIN. That concludes the questions that I have to ask, Mr. Chairman.

Senator GURNEY. Do you have any questions, Mr. Sourwine?

Mr. SOURWINE. I have a few Mr. Chairman. I will try to be brief. Sir, you have in a number of ways appeared to imply that the results received or discovered in experiments with monkeys are reliable criteria or at least reliable indicia with respect to what can be expected under similar or identical circumstances in the case of a man. Is this true?

Dr. HEATH. That is correct.

Mr. SOURWINE. Oh, in part of your discussion you referred to either 8 or 18 percent of delta–9 THC contained in smoked marihuana. Was that 18 or 9 percent?

Dr. HEATH. When we smoked the monkeys with marihuana we had an assay of the percentage of THC in that preparation, and then, on a per weight basis, weighed out the amount of marihuana for that particular monkey to smoke. That was based on what heavy or moderate hashish users would smoke. When we were trying to relate the intravenous delta–9 THC to the ingestion of active ingredients through the marihuana smoked, we at first thought we would give the total amount intravenously that the monkey was getting by smoking it. But when we did that we nearly killed the monkey. It has been known that smoking is not the most efficient way for getting the active ingredient. We adjusted the dosage so that we would get a good effect on the monkey without risking its life, and came out with a total dose of 18 percent.

In other words, when we have the delta–9 THC, we could only give 18 percent of the delta–9 THC contained in the marihuana they smoked.

Mr. SOURWINE. What I was trying to get at is this question. Does that mean, as it appears to, that in smoking a monkey can get and does get roughly five times as much of the delta–9 THC as it would take to kill him if he got all that at once? In other words, is a monkey getting a lethal dose in the smoking?

Dr. HEATH. There are a number of ways of interpreting that fact that I gave you. One is that taking it into the lungs is not the most efficient way of getting the active materials into the bloodstream. A lot of it is lost in smoking—that is the most important factor.

Mr. SOURWINE. Thank you, sir. You told us that for controlled smoking with inactive marihuana, the amount of starting material was equated with the amount of marihuana in the active preparations. Would you tell us for the record what was this equation?

Dr. HEATH. Right. Here is the way that is done, backing up again. With the marihuana we knew how much delta–9 THC was in it, and we knew the dose per kilogram of weight we were going to give, so knowing the strength of the marihuana we would then weigh out the total amount of the crude weed which contained the active material and thus gave the dose that we wanted.

In our control, where we were using inactive marihuana we would just weigh out the same amount of material that was calculated for the monkeys smoking active marihuana.

Mr. SOURWINE. But that was deactivated?

Dr. HEATH. Deactivated.

Mr. SOURWINE. It was marihuana with its teeth pulled?

Dr. HEATH. That is correct—exactly.

Mr. SOURWINE. Now, Professor, I believe I have just one more question. Did your protocol permit you to draw conclusions constituting or underlying comparisons between the deleterious effects of marihuana and the deleterious effects of just the smoke without the tetrahydrocannabinol?

Dr. HEATH. I am sorry, sir. I didn't follow your question.

Mr. SOURWINE. I am asking whether under your protocol for these experiments you were in a position to draw any conclusions, any comparisons, between the damage or the results of the effects of the marihuana smoking as compared with similar or somewhat similar effects, if any, involved in the mere smoking of tobacco or detoxified——

Dr. HEATH. Right. We didn't get——

Mr. SOURWINE. Detoxified marihuana.

Dr. HEATH. We got neither immediate nor lasting effects with the detoxified marihuana. It looks like the effects on the brain are due to the delta-9 THC, possibly along with other specific ingredients.

We have used tobacco as a control in other studies we reported, and it does not induce these changes either. So the conclusion would be that neither smoke, per se, tobacco, nor inactive marihuana induces the changes with which we are concerned.

Mr. SOURWINE. The last part of the question. You indicated in your statement that there were monkey deaths due to respiratory problems, apparently caused by the smoking of the monkeys. Do you have any indication whether these problems were caused merely by the products of smoking, aside from the delta-9 THC?

Dr. HEATH. Yes. I think I will have to speculate but there is an awful lot of "junk" in marihuana that is bound to be extremely harsh and irritating. Marihuana is much more harsh and irritating than tobacco and produces considerable irritation in the respiratory tract of these animals. We feel this was the reason the two animals developed pneumonia and subsequently died.

Mr. SOURWINE. I have no further questions.

Senator GURNEY. Thank you, Dr. Heath. Let me thank you for your most important and constructive testimony from your research. The subcommittee is grateful to you for being here this morning. You have made a great contribution in your study in trying to find out about the effects of marihuana.

Our next witness is Professor Paton.

Would you identify yourself for the record, Professor?

TESTIMONY OF DR. W. D. M. PATON, THE PROFESSOR OF PHARMACOLOGY, UNIVERSITY OF OXFORD

Dr. PATON. I am professor of pharmacology in the University of Oxford. I originally trained in physiology in Oxford, qualified in 1942 in medicine, did a residency, and then pathology for a year, and

then during the war entered the service of the Medical Research Council to work on diving and submarine problems. My own interest in cannabis was aroused by a conference on adolescent drug dependence in 1966, from which it seemed that in modern terms the sort of pharmacological work that was needed, was not really being initiated, and I began my work in 1969.

Senator GURNEY. Just one or two other questions, Professor, to pin down the record. You were trained as a physiologist in Oxford, where you took your first degree in 1938?

Dr. PATON. I took my degree in 1938 at Oxford.

Senator GURNEY. And then after being a clinical student at University Hospital London, your degrees of bachelor of medicine and bachelor or surgery from Oxford were in 1942?

Dr. PATON. Correct.

Senator GURNEY. And you were a house physician at the University College Hospital, London, and also a pathologist?

Dr. PATON. Yes.

Senator GURNEY. And how long was that?

Dr. PATON. The residency was 6 months. Then I did a year in pathology at a sanatorium.

Senator GURNEY. You are the author, with J. P. Payne, of "Pharmacological Principles and Practice", which is one of the standard textbooks on the subject in the English-speaking world?

Dr. PATON. It was, I would not claim it is now, when one has failed to revise it. It is now about 6 years old.

Senator GURNEY. You are chairman of the Editorial Board of the British Pharmacological Society;

Dr. PATON. Yes, that is right.

Senator GURNEY. And are you the chairman of the Committee on Drug Dependence of the British Medical Research Council?

Dr. PATON. I am.

Senator GURNEY. Could you just briefly tell us what the British Medical Research Council is?

Dr. PATON. Our Medical Research Council is roughly equivalent to your National Institutes of Health.

Senator GURNEY. I see.

Dr. PATON. I served on the Council for 4 years. I have chaired a number of its committees and I am now chairman of this particular committee.

Senator GURNEY. How long have you been involved in the study of cannabis?

Dr. PATON. I started thinking and reading about it back about 1966. My own work on it, directly experimenting with it, started in 1969.

Senator GURNEY. Would you proceed with your statement?

Dr. PATON. Some of my earlier work has been relevant: on anesthetics (dating back to 1944 in connection with narcosis in diving and submarine escape), and on opiates (from 1949). The statement that follows rests partly on this work, partly on my own informal contacts with drug users, and partly on a review of the recent research on the effects in animals and man (written together with Dr.

R. G. Pertwee and Dr. Elisabeth Tylden) which forms three chapters in "Marihuana" ed. R. Mechoulam, Academic Press, recently published. Of this work (400–500 papers), usually only a small fraction is referred to in official reports and other writings. My bibliography now reaches over 700 papers which have material that is important in them. I will try to bring out what appear to me the salient points of all this work, interpreted from my pharmacological experience, and taking for the most part the point of view of preventive medicine.

It is sometimes said that cigarettes and alcohol are as bad as, or worse than cannabis, yet they are "legal"—why should not cannabis be too? I should like to say that I will compare these later from the pharmacological point of view and from my own attitude in this field, that of preventive medicine. But, before doing this, I think one must review the actions of the cannabis, particularly because very little publicity indeed has hitherto been given to many of these actions.

Senator Gurney. Professor Paton, I wonder if you could explain to the subcommittee and to me especially, because I really do not know, what is the difference between the term cannabis and marihuana and hashish?

Dr. Paton. Cannabis is a botanical term, the name of a plant. There has been a considerable variety of terms. This is a botanical term. Marihuana is the term usually given to the plant without any special treatment, dried for use. Hashish is a name where the resin, chiefly in the flowering heads, is in some way or other partially purified. You can do this in various ways, if you simply press a whole lot of the flowering tops of plants together the resin aggregates; and according to how far you push this you get a richer and richer preparation. I think it is worth stressing that the dividing line, this is my view, between marihuana and hashish is not a very good one. You can get hashishes which have decayed and they may have quite a loss of THC content; and you can get marihuana such as some people have grown in England from seeds, and just the leaves contain a remarkable amount of THC.

I shall use the term cannabis rather than marihuana, since the use of the latter word may suggest a sharper distinction from hashish than in fact exists (both are mixtures of cannabis resin with other material from the plant), and perhaps also begs the question whether or not it would be possible to legislate differently for them.

The first point to stress is that cannabis is a complex mixture of chemicals; I am not sure of the latest score, but there are certainly 50 identifiable substances in it. At least six of these are known to have a biological action: tetrahydrocannabinol (THC), propyl-THC, cannabidiol, cannabinol, and a group of water soluble materials giving alkaloidal reactions. This affects, inter alia, the suggestion that one might permit a preparation containing up to 1 or 2 percent THC to be marketed: this would only be feasible if THC were the only active principle. It also means that pharmacological or other studies which are limited to THC have only a restricted relevance to problems of human usage of cannabis.

FAT-SOLUBILITY

Second, and possibly the most important single fact about cannabis, apart from the fact of its psychic action, is that THC, the main psychically active principle, is intensely soluble in fat, as we pointed out in 1970. It has an octanol/water partition coefficient of about 6,000 to one, over 10,000 times that of alcohol. Corresponding to this is a low solubility in water. Its fat solubility is greater than that of industrial solvents, and is exceeded only by substances like DDT. The other cannabinoids share these properties. This solubility gives it an affinity for, and ability to traverse, the fatty material in cell-membranes.

From this physical property follows: (a) the activity of cannabis by all routes of administration; (b) its cumulative effect, and the persistence of effect when drug is withdrawn it tends to persist in the body because it is sitting in the fatty areas which cannot be washed out by the watery system of the body. (We take water in at one end and lose it at the other—rinsing the body all the time—to put it colloquially.); (c) its passage into all parts of the body, including brain, adrenal gland, ovary, testis, and foetus; (d) the diffuseness of its effects because it is able to reach every cell in the body; (e) the overlap in its effects with those of one important group of fat-soluble materials, the general anesthetics such as chloroform.

Perhaps I should say a special word about the brain, where perhaps the most important fatty material in our bodies is located, though in much smaller percentage than (say) in adipose tissue. Here, too, cumulation of THC and its first two metabolites has been found.

TOXICITY

(a) Fat affinity and cumulation in the body in themselves are not necessarily harmful, even if cumulation is undesirable in principle. The fundamental test is a biological one, whether toxicity is cumulative. This has been found to be the case; for a mouse, it requires one-tenth as much cannabis to kill if given in repeated daily doses as if given in a single dose. Similar cumulative toxicity has been found for THC and in other animals and by more delicate methods than lethality. Inferences must not be drawn, therefore, from responses to single exposures to the likely effect of repeated doses.

(b) We have found that toxicity, as judged by loss of weight and lethality, is associated with the fat-soluble fraction of cannabis; THC appears to be the main, but not the only, substance responsible. It appears impracticable, therefore, to dissociate the psychic and the toxic effects.

(c) The question of lethality in man is important. It is often said there have been none. Since few practitioners would know how to diagnose a death caused, or contributed to, by cannabis, and since it could not at present be proved by forensic analysis, only scanty information can be expected in any case. The case reported by Heyndrickx et al.,[1] in the light of this, is rather convincing.

[1] Heyndrickx, A., Scheiris, C., and Schepens, P. (1969), J. Pharm. Belg. 24, 371.

Possibly more important is to point to three ways in which cannabis could indeed cause or facilitate death although proof in a particular case would be difficult. (a) It produces a considerable tachycardia,[2] and this may be associated with electrocardiographic changes and ventricular extrasystoles.[3] It is not at all impossible that this, in unfavorable circumstances in a chronic user, could progress to ventricular fibrillation [4] and death. (b) It causes a dilatation of peripheral blood vessels, corresponding to the hypotensive action in animals. This probably underlies the "fainting attacks" reported in the literature as well as by my own contacts. This involves "postural hypotension," in which the capacity of the body to correct for the upright position fails, and the blood drains from the brain. As with other hypotensive drugs, if the subject could not become horizontal either deliberately or by falling—for example, because he was in a chair—blood supply to the brain might fail. (c) Cannabis, chiefly because of its cannabidiol content, can potentiate and prolong the action of barbiturates—as well as other drugs used in medical treatment. This could mean that a nonlethal dose of barbiturate became lethal.

Regardless of decisions about the law, one wishes that all cannabis users were aware of these possibilities.

TERATOGENICITY

Administration of cannabis during the vulnerable period of pregnancy has been found to cause fetal death and fetal abnormality in three species of animals. The deformity includes lack of limbs—reduction-deformity. The factor responsible has not been identified but does not appear to be THC although new work is showing that THC kills a majority of fetuses and in the remainder produces an increased incidence of stillbirth and stunting. The effect is dose related, an important thing to establish if cause and effect are considered.

These results are sometimes dismissed on the grounds that any drug in sufficient dose will be teratogenic. While this is not quite accurate, there is evidence that serious disturbance of the mother can have such an effect. This gives an added importance to the criterion suggested by Robson and Sullivan which I would adopt; that a result should be taken as significant when the teratogenic dose is a small fraction of the dose lethal to the mother. This is the case with cannabis, and is in contrast to other drugs, including nicotine and aspirin.

A very important question is whether cannabis directly affects the genetic material, that is, nucleic acid. Early reports of interference with cell division indicated this. These have been confirmed. Dr. Nahas' and Dr. Morishima's reports here have clinched the issue. One must notice that general anesthetics as a class can also produce fetal abnormality. A provisional hypothesis for teratogenicity, therefore is that this action of cannabis reflects its fat solubility and re-

[2] Acceleration of the heart rate.
[3] Extra beats of the heart originating not, as normally, in the auricles, but in the ventricles themselves.
[4] A condition where the ventricular contraction becomes uncoordinated, and cardiac output fails.

lation to anesthetics, and constitutes a sort of anesthesia, for instance, of limb buds developing in the fetus at critical periods—hence the reduction-deformity. It must be stressed that all I have said refers simply to the development of the fetus. There is also the question whether the genetic material, perhaps as a result of interference with cell division is altered—giving life to heritable defect.

CARCINOGENICITY AND LUNG PATHOLOGY

Like the tar from cigarettes, reefer tar is carcinogenic when painted on mouse skin. Cannabis smoke produces changes in cultures of lung tissue, and Dr. Leuchtenberger will be mentioning this, including loss of contact-inhibition between cells. THC in low concentration resembles the carcinogen methyl-chlolanthrene in generating malignancy in rat embryo cells incubated with a murine leucemia virus, but is slower in action. The irritant effect of the smoke on the respiratory tract is well known to users and is associated with bronchial pathology.

These effects are becoming very important. Originally, one was uncertain about their significance, and about what the balance would be between the facts that more cigarettes than reefers will normally be smoked in any one day, whereas inhalation and retention of the smoke is much deeper and more efficient with the reefer.

Senator GURNEY. Would you describe what a reefer is to the committee?

Dr. PATON. A reefer is a marihuana cigarette prepared in different ways in different parts of the world.

But now lung damage, in the form of emphysema, is being repeatedly recorded and I was very interested to hear, in Dr. Heath's presentation today, of the respiratory condition of his monkeys. Emphysema is normally a disease of much later life; but now the quite unexpected—to me, at least—prospect of a new crop of respiratory cripples early in life, is opening up. Originally, I thought the cancer risk was the main problem; cannabis has never been used extensively in a society with an expectation of life long enough to show a carcinogenic effect in man, until recent years. In effect, a new experiment in cancer epidemiology started 5 to 10 years ago. To this I would now add respiratory pathology generally; and because it shows itself early, just as with cigarette smoking bronchitis is an early warning of that pathology, I believe that medical epidemiological studies of pulmonary pathology of cannabis are on a wide scale, are now urgent for getting an early warning of a carcinogenic situation.

CELLULAR EFFECTS OF CANNABIS AND THC

Numerous such effects have now been described, which we can often class as cell pathology, including actions on microsomes,[1] on mitochondria,[2] on neurones, fibroblasts, white blood cells, and on dividing cells, affecting metabolism, energy utilization, synthesis of

[1] Structures inside the cell, particularly liver cells, responsible inter alia for detoxication.
[2] Structures inside cells responsible for energy production.

cellular constituents, and immunological responses. To this we must add the recent observation that chronic administration of THC to young rats leads to a reduction in brain and heart weight. Such effects are to be expected, rather than a matter of surprise, from a drug with a high affinity for lipid in a cell membrane. It should be noted that the local concentrations of THC or its metabolite in the cell membranes will be far higher than those in the blood; theoretically, one would expect a concentration factor of several hundred; experimentally, concentrations of 600-fold with brain and 380 with red cell membranes.

An important aspect of these effects is what they imply for maturation of an individual; we are concerned not only with the effect of a drug on a mature adult, but also what it does to schoolchildren down to the ages of 11 and 12, still developing in many ways. The interference by cannabis with both cell metabolism and cell division is very worrying.

Mr. Sourwine. Mr. Chairman, may I ask one question? Am I correct in understanding the gist of what you are saying is this: that widespread use of marihuana is likely to produce in our children a generation of little old people?

Dr. Paton. I think that is a little further than that in what I am saying, but it is a very accurate description. It is only an opinion but it is a very accurate expression of it.

Mr. Sourwine. And no one could predict what the third generation would be in that case, could they?

Dr. Paton. No.

THE RELEVANCE OF ANIMAL WORK

It may be argued that actions in animals are of little relevance to man. However, the pharmaceutical industry, and the bodies which supervise it, do not operate on this pre-Darwinian principle. Difficulties chiefly arise when an inordinately high safety factor has been stipulated. But there is also misunderstanding over rates of dosage. It is to be expected that small animals will require proportionately larger doses—per unit body weight—than man, just as they need proportionately more food, because of their faster metabolic rate. One can estimate a mouse dose on this basis as 10 times that of man; taking this together with the rates of human use reported in WHO Special Report No. 478—up to or exceeding 10 milligrams per kilogram THC per day—it appears that almost all the experimental work reported in animals is relevant to man. The conclusion is reinforced by the NIMH-sponsored toxicity studies on monkeys. A daily dose of 50 milligrams per kilogram orally of THC killed one of six monkeys; damage to the pancreas, ulcerative colitis, and myeloid hyperplasia were noted. This result, at doses which proved partially lethal at only 10 times some rates of human consumption, makes no allowance for contribution by other toxic materials in cannabis.

TOLERANCE

I mentioned high rates of human use. People have expressed incredulty at this, yet it is well established. I would like to deposit an article on consumption in a group of English students.

Senator GURNEY. The article will be received in the record and made a part of the record if it is available.

[The article referred to may be found in the appendix, p. 393.]

Dr. PATON. This is perhaps the best evidence yet, since the composition of the actual reefers being used was measured; uses ranged up to 199 milligrams THC per day, around 20 times the ordinary dose for a high. By itself it shows the degree of tolerance that is achieved, with the resulting need to take high doses for an effect. By the same token, toxicity and accumulation at these levels must be considered.

DIFFICULTIES IN THE EXTENSION OF ANALYTIC WORK TO MAN

Although there are a number of human studies on the effects of single small doses, there is still no systematic modern study of the bodily effects of continued cannabis administration. One reason is that while limited dosage is acceptable for volunteers, dosage over a prolonged period at the higher rates of use at least in my view, is not. It would be possible to study users themselves, if a method of urine and blood analysis existed capable of verifying their actual consumption.

If I could interpose here, near Oxford people have bought horse manure and smoked it as cannabis. There are other similar examples that are known by people familiar with the field.

Senator GURNEY. That's a pretty dirty trick.

[Laughter.]

Dr. PATON. Biochemical verification, however, is at present not practicable; as a result only the subject's testimony as to his rate of consumption of a substance of unknown composition is available, and this is hardly sufficient. Once methods of analysis of body fluids are adequate, the position should improve considerably.

PSYCHOLOGICAL EFFECTS IN MAN

It is nevertheless possible and useful to construct a rough composite picture of all of the psychological effects in man, if one brings together a number of things.

(a) The neurophysiological observations, in man and animals, of the kind which Dr. Heath has already discussed, of hypersynchronous discharges from the deeper parts of the brain—not the cortex—as a result of giving cannabis or THC. These discharges have been termed "epileptiform."

(b) The observation by Campbell and his colleagues of an apparent loss of brain substance in the deeper regions, in a group of young chronic cannabis users. This needs further exploration, and it is likely that it is now possible with new noninvasive radiographic techniques.

Senator GURNEY. What do you mean, Professor, by loss of brain substance?

Dr. PATON. Dr. Campbell's paper [see appendix, p. 383] has been deposited in an earlier hearing, and what he observed was, if you inject air into the spinal cord and you adjust the position of the patients head, you can get it to track into the inner fluid-filled cham-

bers of the brain called the ventricles. He then x-rayed them and in short, found in a series of 10 the ventricles were significantly larger than in a series of 13 best controls that he could obtain. Because the skull is a rigid box, if there is a larger empty space inside it the total substance of the brain must be correspondingly reduced. It was on that type of observation that he thought there must be a reduction in the mass of the brain, and it pointed also to the localization where that reduction was taking place. There was a very interesting change of shape of ventricles that became rounded; and that suggests the loss of substance was in fact in adjacent regions to the ventricles—a point which Dr. Heath has already taken up at this meeting.

(c) The cumulative property of THC, and its affinity for fat and hence for cell membranes.

(d) The numerous psychiatric reports of gradual psychological change, which becomes less and less readily reversible, the longer the cannabis exposure. [This was first pointed out by Dr. Bromberg [1] in this country in 1939, although delayed recovery may well have been known in the Moslem community in medieval times; see Schwarz, J. Amer. Med. Assn. *223*, p. 195. 1973.] This suggests something permanent or semipermanent.

(e) The fact that most of the elements of this psychological change—paranoid feelings, change in mood, cognitive impairment, loss of memory, loss of concentration, amotivational state, introspective preoccupation with internal imagery, hallucination—can be reversibly produced by single doses of THC or cannabis in normal volunteers.

(f) The ability of cannabis to affect cellular metabolism and cell division.

These findings converge to a remarkable extent in supporting a prima facie view that repeated cannabis use acts on the deeper parts of the brain—where sensory information is processed and mood controlled; that this is at first reversible, but becomes more persistent as cumulation occurs, and that later irreversible changes occur with loss of brain substance, due either to interference with the capacity of brain cells to synthesize their requirements or to interference with cell division.

It is quite likely that all this would be accepted and acted upon, by the cannabis user, were it not for the visual imagery, and—here cannabis is very like nitrous oxide—the euphoria and the conviction of insight and cosmic significance.

Mr. Sourwine. Nitrous oxide is laughing gas?

Dr. Paton. Laughing gas.

COMPARISON WITH ALCOHOL AND TOBACCO

One may summarize this as follows: (1) Alcohol is taken, often diluted with food, and often for taste or to quench thirst rather than for psychic effect; it is eliminated in a few hours, there is little or no evidence for carcinogenicity or teratogenicity particularly if nutritional defect and correlation with smoking are allowed for;

[1] Bromberg, W. (1939). J. Amer. Med. Assn. 113, 4.

psychotic phenomena only occur after heavy and prolonged dosage: it occurs naturally in the body of animals, and probably also in man; it has valid medical uses for nutrition and as a vasodilator; it escalates only to itself; the price paid for overuse is paid in later life.

(2) Tobacco is taken partly for relaxation, partly to assist work, and there is some evidence of an improvement in mental function; the nicotine in it is rapidly metabolized and noncumulative; the evidence suggests that it is the tar that is carcinogenic, and the risk can be reduced if inhalation is avoided, nicotine being absorbed through the mouth; it is not teratogenic; no psychotic phenomena occur; it is not a natural constituent; it has no medical use; it does not escalate; the price paid for overuse is paid in later life—reducing life expectancy from about 75 years to 70 years.

(3) Cannabis is taken specifically, and usually by itself—sometimes with other drugs—for its psychic action; it is cumulative and persistent; its tar is carcinogenic and failure to inhale reduces its effect considerably; experimentally it is teratogenic; psychotic phenomena may occur with a single dose; it is not a natural constituent; prolonged trial in medicine from the 1840's led to its abandonment from pharmacopeias; it can predispose to the use of other drugs; the price for its overuse is paid in adolescence or in early life.

Senator GURNEY. I am going to have to interrupt here, Professor Paton. I have another vote and that means I have just enough time to get there, so I will recess this until later.

[A recess was taken.]

[Whereupon, at 12:45 p.m., the hearing was recessed, to reconvene at 2 p.m., this same day.]

AFTERNOON SESSION

Senator GURNEY. The subcommittee will come to order. We will begin by finishing the statement of Professor Paton.

STATEMENT OF DR. W. D. M. PATON, PROFESSOR OF PHARMACOLOGY, UNIVERSITY OF OXFORD—Resumed

Dr. PATON. I would like to summarize the last point I was making by saying it seems to me that cannabis shares the disadvantages of alcohol and tobacco, together with its own psychotogenic and biochemical actions, its chronic effects being accentuated by its cumulative tendency, giving it much earlier adverse action.

THE QUESTION OF LEGALIZATION

I should like to turn now to the question of legalization, about which, of course, I speak only as an individual.

(a) Viewing cannabis as if it were a new pharmaceutical product, I could not agree to approval being given to the introduction, for general and repeated consumption, of a substance shown experimentally to be carcinogenic, teratogenic, and cumulative, and able to interfere with a variety of cellular processes, until it had been

shown, quite unequivocally, that, for some reason, humans were exempt from the actions concerned.

(b) There is no rational dividing line between cannabis and other drugs such as LSD or some opiates. A high dose of cannabis overlaps with a low dose of LSD, in its hallucinatory and psychotomimetic action, and with the less active opiates, in respect of analgesia, euphoria, and "day-dreaming" state. In fact, since cannabis is unique among these drugs for its cumulative action, I would put it lower in the list for legalization than some others. One needs to ask, what other drugs can produce prolonged cognitive impairment in a young person?

(c) In a similar way, it does not seem feasible to me to propose legalization of cannabis of limited potency. There is in fact an analogy with alcohol here: we have marihuana, 1–2 percent THC, and weak beers, 2 percent alcohol; hashish, say 8 percent THC, wines, 8–15 percent alcohol; and so to speak, "hard hashish," that is hashish oil, on the illicit market—up to 30–40 percent THC, hard liquor, 30–50 percent alcohol. To suggest one could legislate for 1 or 2 percent THC is like suggesting one could legislate for weak beer. It would remove none of the present objections to cannabis legislation, while yet allowing the drug to be used.

(d) The significance of progression from cannabis to other drugs has been much discussed, and my own 1968 paper severely, but fallaciously, criticized. The fallacy was exposed, inter alia, by R. C. Pillard in the New England Journal of Medicine (197) *285*, 416-7). The final report of the Le Dain Commission concluded as regards LSD that "the use of cannabis definitely facilitates the use of LSD or predisposes a certain number of individuals to experiment with it." The arguments they give, including the relationship between the nature of the two drugs and the findings that over 95 percent of those who had used LSD had used cannabis, were the same as those I had advanced in respect of heroin and cannabis. My argument also cited the remarkable temporal coincidence between cannabis convictions and heroin addiction in the United Kingdom; evidence of this sort has not been provided in respect of LSD.

Today, with the further evolution of drug use, it seems clear that depending on availability of drug, various patterns of progression are possible, in which one would include cannabis to opiates, cannabis to LSD, and cannabis low potency to cannabis high potency. Simple reasons can now be seen: that cannabis increases suggestibility—this was referred to in the Wooten Report in Britain, in 1968—impairs memory, that is, your capacity to remember the criteria by which you judge your actions; and that it overlaps in pharmacological actions with opiates—euphoria, analgesia, day-dreaming state, and with LSD—visual imagery. It is therefore well-suited to providing a halfway house, converting one major step directly to use of opiates, LSD, or hashish, into two smaller and more easily accepted steps.

The growth of polydrug use may now have made it impossible to define patterns of progression accurately. But I would still hazard the opinion that no program to get rid of opiate addiction or LSD use will really succeed until cannabis use declines. Cannabis can serve as well to cause relapse, as to initiate drug use.

(e) The last point in weighing up the virtues and disadvantages of legalization, of which I am merely putting one side, of course, concerns the age of those involved. If someone dies of alcoholism or lung cancer at the age of 50 onwards, that is a loss; but the individual has had 30 years of adult life, and the chance to make his own contribution. But the adolescent, dead or socially inactivated by 20 years old, has never even had a start on mature life; the loss, both for him or her, and for society, is incalculably greater.

Senator GURNEY. What do you mean, Professor, by socially inactivated?

Dr. PATON. It means that he is brought to a state where he cannot make the ordinary contribution one expects. That the jobs he does, the building up of family, the role he plays in society are just so much less than his potential.

Senator GURNEY. Caused by the excessive use of marihuana or cannabis?

Dr. PATON. Yes. One is referring to so many pictures. With a drug addict, that is a complete pattern. But I do not believe it is necessary to postulate full development of classical drug addiction; some of the boys that I see who have had a university training and now are doing trivial jobs, if they go on like that for 5 years at a vital period in their life, I think that is going to mean a measure of social inactivation.

THE DIFFICULTY OF FRAMING A POLICY

My own opinion is that it would be disastrous to make it legal even to possess cannabis. If one talks, not to lawyers or sociologists who are concentrating on penal problems, but to schoolchildren and students, at least in the United Kingdom, it is not at all clear that a majority would even wish for this to happen. But nevertheless, there would be for the foreseeable future a large number of people breaking the law, just as they do over speed limits, customs regulations, and income tax return. It seems that one would have to treat a cannabis possession similarly.

I might say I find it difficult to extrapolate from English to American practice here. We do not have traffic tickets. We have, it is a court offense, and I do not want to be misinterpreted by saying that I think cannabis possession should be treated too trivially. I am still thinking of it as a court offense. One has to treat cannabis possession similarly accepting that the majority of offenses would not be recognized, yet maintaining the legal position about it. Viewing it in this way might, indeed, help to deglamorize it.

But something more is needed. It would be quite right for the debate to sharpen our criticism of alcohol and tobacco. Further, for a significant number of youngsters, who have found a reward or consolation, or pleasure in cannabis, there is the question, "If not pot, what?" It is for the framing of a constructive answer to this question that new creative thinking is urgently needed.

Senator GURNEY. Thank you, professor. I have a lot of questions I would like to ask but we have had such a situation over there in the Senate floor today that we lost about half of our time so I

am going to let counsel do most of the questioning so we can get at the areas that we want to put in the record. I just do want to ask you one question.

You said, in your statement you said you spent a good deal of time upon the effects upon cells of cannabis and so I would ask you this question: in your opinion, does the use of cannabis result in permanent cell damage to the human body?

Dr. Paton. I think you have to specify the cell. It seems to me it is quite clear from the recorded evidence about bronchial, pulmonary pathology that you can say there are cells that were damaged. I think the fundamental question one is getting at in that question, well, there are two points. It has been said that cannabis does not affect cells; a popular book on the subject says no sign of cell damage has been recorded. That is just false. There are many such recorded things in an experimental way.

But the real question, to my mind, is does it cause cellular damage in the brain of an irreversible kind?

Senator Gurney. That was the next question I was going to put.

Dr. Paton. And I do not think we can say other than that there is a high probability of that. What this needs is top class neuropathology to be done as microscopical sections or electromicroscopic photographs showing the change and until that is done people can disbelieve it. But I think the probabilities are high.

Senator Gurney. In any event, the use of cannabis certainly has a dramatic effect upon cells in the brain.

Dr. Paton. Yes. Functionally, there is no doubt about the effect on them.

Senator Gurney. Counsel.

Mr. Martin. Just a few questions. General Lewis W. Walt, when he reported to the subcommittee on the world drug situation in 1972, described marihuana as a kind of universal threshold drug through which young people make their entry into the drug culture—the drug of first preference. Would you consider this an accurate description?

Dr. Paton. On a simple question of fact in British surveys, at least, it is not always a drug of first preference, and I think if one wants to look generally one has at least to put amphetamines alongside.

I do not know whether it is the occasion of entry into a culture or a cause of the culture. I was very struck, despite its, I suppose, descriptive character, by the paper by Drs. Kolansky and Moore—I think it is being talked about later—which showed not only that with people receiving cannabis, their personality and behavior went a certain way, this was known, but also that if they gave up using cannabis they tracked back in their religions or in matters such as habits or family breakdown, or loss of jobs; and I have begun to wonder, as other people have, whether it is not that cannabis is an entry to a culture but that cannabis creates an outlook which generates a culture. So that I do not quite want to accept General Walt's remarks and I just make those comments on them.

Mr. Martin. Thank you.

Now, it is also widely believed in this country that marihuana does

not lead to tolerance or habituation. That statement has figured in a number of reports. Does this conform with your own experience?

Dr. PATON. I have had no direct experience in man, just in reports, but it seems to me the evidence shows it is false. It seems to me it has been shown to be false since Mayor LaGuardia's report in the 1940's. They had experiments there which showed users were three times more tolerant than nonusers, and all the evidence since then has substantiated this.

So far as I know, the only reason to suggest that it is not true is what I regard as a rather poorly controlled study by Drs. Weil, Zinberg and Nelsen which, of course, is very well known.

Mr. MARTIN. You mentioned the fact, Professor Paton, that you have by this time accumulated some 700 scientific research papers on marihuana since you first embarked on this study some 5 or 6 years ago. Would you be prepared to offer an estimate of the consensus of these papers?

To put the question a little differently, do you see any trend in either direction on the part of cannabis research scientists around the world?

Dr. PATON. I think scientists as a body tend to feel vulnerable about value judgments, and I would say the bulk of these papers rather try to avoid saying cannabis is good or cannabis is bad. At the same time I think, and I will not put it stronger than this, there is a mental reserve which has begun to appear in the scientific literature and I certainly notice this at scientific meetings. There was a meeting a fortnight ago in England where I was surprised at the caution about cannabis expressed. I would link this, perhaps going beyond your question, by saying that I think too, there has been a change in the nature of the work; that now in what I call cell pathology, analytic work on cellular behavior, there is a great deal of recent work of that kind, and much less functional experimental psychology studies, although that goes on. I suspect that these two trends are linked. People are seeing how important it is to ask, we will call it experimental functional or pathological or cellular questions, and that the changes toward reserve of attitude and in experimental techniques in fact are linked.

Mr. MARTIN. If I understood your remarks correctly, Professor Paton, what you said implies that you have met very few cannabis research scientists who now take a tolerant or benign attitude toward cannabis, who feel that it is not seriously harmful and we do not have to be terribly concerned about its spread through society.

Dr. PATON. I do not usually raise this subject with them because it is in the area where one feels vulnerable. But wherever I have raised it, I would say that your statement is absolutely right. Now, practically, none of them are willing to let cannabis go free.

Mr. MARTIN. That concludes my questions, Mr. Chairman.

Senator GURNEY. Mr. Sourwine.

Mr. SOURWINE. I have one, Mr. Chairman.

Professor, am I correct in my understanding from your testimony about teratogenicity that when a pregnant woman smokes marihuana her baby is in danger?

Dr. PATON. Yes.

Mr. SOURWINE. I have no other questions, Mr. Chairman.

Senator GURNEY. One final question, Professor. You mentioned in your comments on the psychological effects of cannabis, you mentioned down here that there were paranoid feelings, changing mood, cognitive impairment, loss of memory, loss of concentration, that sort of thing, and you mentioned that in respect to this could be reversibly produced by single doses of the chemical THC.

My question is, do you have anything to say on the continued and persistent use of cannabis? Would it bring permanent paranoid feelings in these other matters that I just referred to?

Dr. PATON. My own thinking about this starts with a paper by Dr. Bromberg I mentioned earlier. He did not himself analyze it in this way but if you do analyze it [1] you end up roughly like this about a number of psychopathological responses which he studied as a clinical psychiatrist; you find if the person consumed cannabis just a day or two they recover very quickly from the psychopathology. If it had been weeks it might take some days. If it had been months it would take weeks. If it was longer than that it became months or more.

This agrees with everything I have seen privately. I do not think we can name the numbers involved. But you know, so long as one sees these results, I do believe that it is a major thing; so much so, if I can say so, that my own future research, for which the Medical Research Council has given me a very substantial grant, is going to be to try to throw light on what is happening not only after cannabis but after alcohol, and barbiturates, in the way of prolonged damage. The evidence as it stands makes me believe either that the drug is persisting as such for much longer than we think even on existing evidence—which would just suggest for months at most—or that cells have been killed or very badly damaged and that time is required for repair. Or, and this is a third possibility which has not been suggested, that something is made in the body from the drug, what one calls a reactive intermediate, which combines in a new way with constituents in the membrane of the cell to produce more or less permanent changes in function. These are three different things, and my own personal research effort is going to try to discover which and what the laws governing these are.

Senator GURNEY. Well, thank you very much, professor, for your contribution to this panel and these hearings.

We will take our next witness, Dr. Stenchever.

Doctor, would you identify yourself for the record?

TESTIMONY OF DR. MORTON STENCHEVER, UNIVERSITY OF UTAH

Dr. STENCHEVER. Yes; I am Dr. Morton Stenchever, chairman of the Department of Obstetrics and Department of Gynecology of the University of Utah.

Senator GURNEY. I will go into a few questions regarding your background to determine your expertise.

You obtained your medical degree in 1956 at the University of Buffalo?

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[1] See table III, page 352, in "Marihuana," ed. R. Mechoulain, Academic Press, 1973 in chapter by W. D. M. Paton, R. G. Pertwee and Elisabeth Tylden.

Dr. STENCHEVER. Correct.

Senator GURNEY. You completed your residency in obstetrics and gynecology at Columbia Presbyterian Medical Center in 1960?

Dr. STENCHEVER. Yes, sir.

Senator GURNEY. And you had a post-doctoral fellowship in the field of mammalian cell genetics—or what is that—cytogenetics—you can see I am no doctor—at Case Western Reserve University in Cleveland in 1962?

Dr. STENCHEVER. Yes, sir.

Senator GURNEY. And since 1965, you have been in charge of two major laboratories working in the field of human and mammalian cytogenetics?

Dr. STENCHEVER. Yes. Cytogenetics.

Senator GURNEY. The first laboratory you took charge of was at Case Western Reserve?

Dr. STENCHEVER. Yes.

Senator GURNEY. Since 1970 you have been in charge of a research laboratory at the University of Utah, where you also serve as chairman of the department of obstetrics and gynecology?

Dr. STENCHEVER. Yes, sir.

Senator GURNEY. And you are the author of a medical textbook entitled, "Human Cytogenetics"?

Dr. STENCHEVER. Yes, sir.

Senator GURNEY. And the author or coauthor of some 50 scientific papers?

Dr. STENCHEVER. Yes, sir.

Senator GURNEY. Generally, what are they on?

Dr. STENCHEVER. The majority are on genetics.

Senator GURNEY. The most recent article that you coauthored was entitled, "Chromosome Breakage in Users of Marihuana", which appeared in the January 1974 issue of the American Journal of Obstetrics and Gynecology?

Dr. STENCHEVER. That is correct.

Senator GURNEY. All right, Would you proceed with your statement, Doctor?

Dr. STENCHEVER. Yes. The statement I am presenting today is essentially the report on research conducted by a team consisting of myself, and my colleagues, Terry J. Kunysz and Marjorie A. Allen, at the University of Utah College of Medicine, Department of Obstetrics and Gynecology. Basically, this research was performed during 1971 and 1972. It was recently described at greater length in the January issue of the American Journal of Obstetrics and Gynecology.

The observation that psychoactive drugs could cause chromosome damage in users was introduced by Cohen and associates and others several years ago. It was first reported that chromosome damage occurred because of the use of lysergic acid diethylamide, LSD. However, a number of studies since that time have cast doubt on whether the drug actually damages chromosomes in users and in a recent review of the literature, Lang concluded that it probably did not. Most users of LSD also use other drugs, particularly marihuana. Gilmour and coworkers found no increase of chromosome aberrations

in light users of marihuana. However, they did find an increase in chromosome breakage in 11 heavy users. In most cases, these users were taking multiple drugs. In a study of rat cells. Pace and associates could find no significant increase in chromosome breakage after exposure of the cells to marihuana in vitro. Studies by Neu and colleagues and by myself and Marjorie Allen yielded no increased incidence of chromosome breakage in the in vitro experiments in human cells exposed to delta-9-tetrahydrocannabinol, THC, one of the active ingredients in marihuana. Marihuana, however, is a composite of a number of agents and its effect on chromosomes is still to be defined.

It was the purpose of our study to report the results of the effect of marihuana use on the chromosomes of a group of healthy college students.

Forty-nine users—29 males and 20 females—and 20 control subjects—12 males and 8 females—were studied concurrently. The average age of the users was 22.3 years, with a range of 17 to 34, and the average age of the control subjects was 28.7 years, with a range of 13 to 52 years. All of the users were college students. Some of the controls were college students while others were members of the staff working at the university. I might add it was difficult to find people who were not using marihuana. No individual in the control group has been exposed to any drugs or medications for 6 months prior to the study, other than an occasional aspirin, and none had been exposed to ionizing irradiation for at least 6 months. A complete medical history was taken on all individuals in the study, as was the recording of the use of alcohol, nicotine and caffeine. The use of marihuana was tabulated for each user according to the date and amount used, classification of the drug as estimated by the user, and any other drug used concurrently. All users smoked as their means of ingestion. Marihuana had been used for a minimum of 6 months and a maximum of 9 years, with an average of 3 years, and previously had been used between 5 hours and 30 days prior to the study.

The studies were carried out on blood leukocytes—these are white blood cells—and tissue culture and harvesting techniques were of a standard type used in our laboratory for several years and reported on many occasions, and in keeping with techniques used in other laboratories. When slides of chromosome spreads were prepared, they were coded so that the observer would not know whether the slides were from a study or control patient. One hundred consecutive intact methaphase spreads for each individual were scored for chromosome damage, including gaps and breaks, and for the presence of abnormal chromosomes. Every abnormal cell was photographed for careful analysis. We were scoring methaphase plates—these are cells which are undergoing mitosic cell division, and that is the time at which you can see the chromosomes most clearly. A chromosome, for those of you who are not acquainted with it, is a structural entity in the cell nucleus which contains the genes and, therefore, is dircetly related to the phenomenon of heredity.

RESULTS

Five basic questions were asked during the study. The first was "Does marihuana use cause chromosome damage?" There was an average of 3.4 cells with chromosome breaks—range 0 to 8—per 100 cells per user and 1.2 cells with breaks—range 0 to 5—per 100 cells per control subject. In other words, 3.4 percent of the cells in the users showed damage, 1.2 percent of the cells in the controls showed damage. The difference was significant at the $p < 0.05$ level. While there was an increase in abnormal chromosome forms seen in the users group over those in the controls, however, the numbers of cells involved were small enough that no statistical analysis could be carried out.

Question 2—"Does the concurrent use of other drugs influence the extent of chromosome damage?" Twenty-seven users of marihuana reported the use of no other drugs during the period of marihuana use, whereas 22 reported the use of other drugs, including barbiturates, amphetamines, tranquilizers, mescaline, LSD, and heroin. Chromosome damage in users of marihuana alone averaged 3.1 cells with breaks per 100 cells, whereas users of marihuana and other drugs averaged 3.7 cells with breaks per 100 cells. The difference was not statistically significant.

Question 3—"Does the frequency of use relate to the extent of damage?" For the purposes of this study a light user was considered to be an individual who used marihuana one time or less a week and a heavy user a person who used marihuana two or more times a week.

Senator GURNEY. When you say using marihuana, are you talking about smoking one cigarette?

Dr. STENCHEVER. If they smoked one cigarette once or less a week they were considered light users. If they smoked two or more a week they were considered heavy users, a bit different from the definitions you heard this morning but this was the standard we used.

Light users had used the drug between 6 months and 9 years with an average of 2.9 years and had last used the drug 18 hours to 30 days before the study, with an average of 5.4 days. Heavy users had used the drug 9 months to 7 years with an average of 3.4 years and had last used the drug 5 hours to 5 days with an average of 1.4 days prior to the study. Twenty-seven users fell into the heavy use category and had an average breakage rate of 3.8 cells per 100 while 22 users were in the light category and had a breakage rate of 3.2 cells per 100. The difference was not significant.

The fourth question involved whether or not the use of caffeine concurrently with marihuana influenced the extent of chromosome damage. While very few of the individuals did not use caffeine, the spread among nonusers of percent breakage was such that there seemed to be no effect additive by the use of caffeine over the use of marihuana alone.

The fifth question was "Do male or female subjects respond differently to marihuana with respect to chromosome damage?" No statistical difference could be seen between them, the 29 male subjects having a breakage rate of 3.7 and the 20 female subjects a breakage rate of 2.9 cells per 100, a nonstatistically significant difference.

DISCUSSION

All data from the study including historical data was computerized and multifactorial analysis carried out. That is, we compared all factors to all other factors in computerized fashion. The only positive correlation of statistical significance was the use of marihuana and the presence of chromosome damage.

A fault of previous studies had been that frequently the drug users had been individuals on multiple drugs and with poor eating and hygiene habits. The individuals in our study were all college students with good nutrition and, for the most part, good hygiene. The study did not demonstrate which ingredient in marihuana was capable of doing the chromosome damage and future studies in our laboratory on in vitro and animal studies will hopefully determine this point. The study did not shed any light into the question of whether or not this chromosome breaking agent or any other chromosome breaking agent is capable of causing abnormalities of unborn children, an increased mutation rate, or an increased incidence of cancer. However, all of these possibilities are potentially there and only further studies of a more detailed nature will be able to answer these questions. It is of interest that a recent study published in the Journal of the American Medical Association by Jacobsen and Berlin entitled "Possible Reproductive Detriment in LSD Users" pointed out that there was indeed a higher incidence of abortion rate and fetal abnormalities in 140 women and their consorts who were using LSD. Unfortunately, in reading this paper it became evident that 100 of these individuals were using marihuana as well. The ability to pinpoint actual problems with any specific drug is difficult in a human experiment because humans tend to experiment with a number of different drugs and also, of course, are subjected to many other variables in their life style.

In conclusion, we feel our data have demonstrated that there is an increased chromosome breakage rate in users of marihuana and that this apparently is not related to the extent of use of the drug, as light users had about the same damage rate as did heavy users. We have not demonstrated a link between marihuana use and an increase in fetal damage or fetal loss, in mutagenesis or in the increased incidence of cancer. We have demonstrated a need to identify the agent in marihuana which causes chromosome damage and our data would suggest that further studies in both human and animals should be undertaken to determine if indeed this agent is capable of damaging fetuses, causing an increased mutation rate and possibly being related to the development of neoplasms.

Senator GURNEY. Well, as I understand it, Doctor, your studies do not show, even though there was chromosome damage, exactly what the effect of that would be. But let me ask this question. Are there any medical studies that show what the effect of chromosome damage is?

Dr. STENCHEVER. Most of the data on what chromosome damage means is tangential. For instance, in people who are irradiated there is a higher incidence of abnormal children and a higher incidence of cancer development and they indeed have an increased number of chromosome breaks in their circulating cells and in the

cells of other tissue. In people from certain families, where familial conditions tend to be associated with increased chromosome breakage rates, in other words, more fragile chromosomes, the incidence of abnormal children and cancer is higher in these families. A number of agents such as the anticancer drugs are capable of breaking chromosomes and indeed have been associated with a higher incidence of malformation in fetuses. So it is tangential data. When you find a chromosome breaking agent, what you have is an agent which is capable of getting into the nucleus of a cell and causing damage. What you see in chromosome damage is the process of cell damage.

Now, there are a number of conditions where rearrangements for chromosomes occur, in other words, two chromosomes breaking and exchanging parts in the healing process leading to well-known medical abnormalities which are diagnosable and which are associated with chromosomal abnormalities. And there is a whole slew of these conditions.

One has to ask how do you get to this? What makes these people have rearranged chromosomes, and we suspect somewhere along the line breakage took place and rearrangement took place? So an agent which can break chromosomes can conceivably lead to these types of problems.

Another thing that an agent that can break chromosomes can potentially do is damage the genes in the chromosomes and, therefore, bring about a mutation, and a number of breaking agents are indeed mutagens, so we have that information.

Now, the other thing that is potentially there is that the damage to the nucleus may injure the cell in such a way that it may elude the body's basic filtering defense mechanisms and lead to a neoplasm. We know most cancers do come from one cell and that is a cell that somehow eludes the body defense mechanisms and there are probably people who are more likely to do this than others. In other words, cancer-prone individuals. So if chromosome damage takes place in these people they are at greater risk of developing cancer than other people.

Senator GURNEY. Mr. Martin.

Mr. MARTIN. Is it correct, Dr. Stenchever, that the research which you conducted with your colleagues in the first research which experimentally substantiates that marihuana results in chromosome breakage?

Dr. STENCHEVER. Yes, sir.

Mr. MARTIN. You make the point in your paper that prior researchers, or a number of prior researchers, have come up with different findings, that is, they found no evidence of breakage. How do you account for the difference between the results they obtained and the results you obtained?

Dr. STENCHEVER. Well, I think there are a lot of reasons for that. Basically, most of the studies were small studies, where a number of variables were not controlled, such as the use of other drugs. I believe that in coding and scoring for breaks one must take great care in doing it blindly because if one does not then research bias comes into it whether you are for or against what you are looking for. It is only human to only see what you want to see.

In our laboratory all of the studies that we have ever carried out in the area of chromosome damage have been done blindly so that the individual doing the scoring does not know from where the cells came and I think that has been one of the bigger criticisms that have come to the previous studies.

Mr. MARTIN. In examining all the facts in retropect, Dr. Stenchever, do you believe that you and your colleagues controlled all of the factors in your experiments as carefully as they could be controlled?

Dr. STENCHEVER. Well, we controlled bias because there was no way that the individual doing the scoring could know who it—which individual had furnished the blood. We tried to control the other variables by taking as careful a history as we could, and by computerizing all of our data and doing multifactorial comparisons so that we could identify at least which areas were statistically significant. In that respect I would say we probably controlled the variables. Of course, when you deal with humans you can only go by what they tell you and I think this is the biggest problem with human experimentation.

Mr. MARTIN. Has anyone faulted your research on the basis of inadequate controls or procedures?

Dr. STENCHEVER. Not since it was published.

Mr. MARTIN. As you know, or as you are probably aware, your study does not agree with a fairly recent study performed on marihuana smokers in Jamaica. This study found no evidence of chromosome breakage. In fact, they found nonsmokers had chromosome damage slightly more often than smokers. Would you be prepared to offer a comment on the difference between this finding and your own findings?

Dr. STENCHEVER. Well, I did have the privilege of seeing a reprint of this material, and there were a number of differences between that study and our study, as I recall. There may have been some technical problems in that the people reporting reported on 25 chromosome spreads per individual and then lumped all of their data together so they were comparing the total number of cells from users with the total number of so-called controls. I think this is a hazardous thing. You have to consider each individual separately and you have got to do enough cells so that you can overcome the artifacts of small numbers, and 25 is a very small number.

The suggestion that only 25 cells were scored would make me think they had technical difficulties because in our laboratory it would be possible to score 10,000 cells if you had the urge to do so. We get lots and lots of material to work with. But there are tissue culture laboratories that probably have not gotten far enough along in their technique to where this is possible, and when I see very small numbers reported it implies to me that probably the technique is at fault. When the technique is at fault then a tremendous number of other variables that can influence the performance in tissue culture come into play and with critical data.

Control groups in our laboratory consistently have breakage rates of between 1 and 2 percent. And as it has turned out here, 1.2 percent and that is what we find year after year after year. I be-

lieve their control group showed a much higher number of breakage which would again imply there were other factors at play.

I think, all in all, I would have to say I would really have to see the specifics of their data but I would guess there were technical variances there that one could criticize.

Mr. MARTIN. You state that your research has satisfied you that, contrary to previous impressions, LSD is not responsible for human chromosome breakage. In the light of this, would you say that LSD is safe to use or reasonably safe to use?

Dr. STENCHEVER. If I had to choose, I would probably use marihuana. I think LSD is potentially a very dangerous drug and, the fact, that we could not prove it broke chromosomes would not detract from my saying that it is a drug that should not be used. One thing I think about the study of marihuana was their inability to find chromosome damage in pure LSD users and our observation that LSD users from previous studies had all been using marihuana and, at the same time, we were doing a series of studies on reproductive failure in our laboratory looking at couples who were infertile or having habitual abortion looking for chromosome reasons for their problem and, it became apparent that almost without exception when we found chromosome breakage in these people we could elicit a history of marihuana use. It could be due to widespread use of marihuana in the community and in no way is scientifically valid but nontheless these two observations, the fact we were seeing damage in marihuana users and we were finding no damage in pure LSD users, we were fortunate enough to have a smaller group, which led us into the experiment I just reported. And I must say we did an in vitro study tissue culture study with THC which turned out to be almost negative and I almost lost interest in doing the current study because I thought we were dealing with a drug which did not break chromosomes. But having done this study I am convinced that marihuana is a breaking agent.

Mr. MARTIN. Have you been the object of any attacks or abuse as a result of your work on marihuana and chromosome damage?

Dr. STENCHEVER. Well, I think that basically what happens is people want to hear what they want to hear, and when I first presented these data in a conference a year ago it was picked up by the newspapers, as one would expect. It was hot copy, and without anyone having the opportunity to look at our data or our studies a number of criticisms have come up. They said it obviously was wrong, and I was attacked because I was an obstetrician and, therefore, knew nothing about genetics. Of course, they did not realize I had had training in genetics as well, and a number of kinds of superficial criticism came up which implied to me that people did not want to believe marihuana was a damaging drug.

But I will say this: since the paper was published I have had no criticisms so I think when people had a chance to look at the data they become more reasonable.

Mr. MARTIN. That concludes my questions, Mr. Chairman.

Senator GURNEY. Mr. Sourwine.

Mr. SOURWINE. None, sir.

Senator GURNEY. Just one question of interest to me. Do you have any problem in getting subjects to test there at the university?

Dr. STENCHEVER. The problems I have are in finding controls. Unfortunately, marihuana is in very wide use even on our campus. I do not know whether it is this year but 3 years ago I polled 100 students and 98 had tried marihuana at least one time.

Senator GURNEY. How about LSD?

Dr. STENCHEVER. LSD has fallen off in its use. When I find someone who has used LSD by and large, they are using a lot of different drugs, they are experimenting at a higher level than just marihuana smoking.

Senator GURNEY. I am told that this hearing room has been reserved beginning a few minutes from now, so we will go to room 1318. That is down the hall to the right around the corner. I am sorry we have to do this but we thought we would be finished long before now. Room 1318.

[Whereupon, the hearing was moved to room 1318.]

Senator GURNEY. The subcommittee will come to order again.

I hope you are patient.

Dr. Nahas, would you identify yourself for the record, please?

TESTIMONY OF DR. GABRIEL NAHAS, COLUMBIA UNIVERSITY

Dr. NAHAS. My name is Gabriel Nahas, I am a research professor of anesthesiology at the College of Physicians at Columbia University.

Senator GURNEY. I will ask you a few questions about your background, you were born in Alexandria, Egypt, in 1920?

Dr. NAHAS. Yes.

Senator GURNEY. You entered the University of Toulouse Medical School in 1938?

Dr. NAHAS. Yes.

Senator GURNEY. While you were at the medical school during World War II, you played an important role in the French Resistance movement, is that right?

Dr. NAHAS. Yes.

Senator GURNEY. For your activities in the French Resistance, you received the Legion of Honor and the Croix de Guerre from the French Government, the Order of the British Empire from the British, and the Presidential Medal of Freedom with Gold Palm from the United States, is that correct?

Dr. NAHAS. Correct.

Senator GURNEY. Your citation for the Medal of Freedom stated that it had been awarded for your services in directing an evasion network that had been responsible for the escape of 200 allied airmen, half of them Americans, is that correct?

Dr. NAHAS. Yes.

Senator GURNEY. I certainly want to congratulate you.

Doctor, on your qualifications, you received your medical degree from the Toulouse Medical School in 1944?

Dr. NAHAS. Yes.

Senator GURNEY. And you were subsequently given a Ph. D. in physiology from the University of Minnesota Medical School in 1953?

Dr. NAHAS. Yes.

Senator GURNEY. And from 1954 to 1955 you served as chief of the laboratory of experimental surgery at the Hospital Marie Lannelongue in Paris, and from 1957 to 1959 you served at Walter Reed Hospital as chief of the respiratory section of the department of cardiorespiratory diseases?

In 1959 you joined Columbia University as associate professor and director of research in the department of anesthesiology? In this post you have had the rank of full professor from 1962 to date? You also serve as an adjunct professor at the Institute of Anesthesiology of the University of Paris, Faculty of Medicine?

Dr. NAHAS. Yes.

Senator GURNEY. And you are the author or coauthor of more than 400 scientific papers, and the author as well of a number of monographs?

Dr. NAHAS. Yes.

Senator GURNEY. In December 1972 you published a work entitled "Marihuana, Deceptive Weed?"

It is accurate, is it not, that this book was given the cold shoulder by all of the TV talk shows; that the New York Times failed to review it, even though it had favorably reviewed some half-dozen books that were promarihuana; and that finally 16 faculty members of the Columbia University College of Physicians and Surgeons this last January 28, sent a joint letter to the editor of the New York Times Book Section, urging that they let your book be reviewed, in the interest of balance and fairness, is that correct?

Dr. NAHAS. Yes.

Senator GURNEY. Did the senders ever receive a reply to this letter?

Dr. NAHAS. No.

Senator GURNEY. Could you provide a copy of the letter for the record?

Dr. NAHAS. Yes.

[The letter referred to follows:]

COLLEGE OF PHYSICIANS & SURGEONS OF COLUMBIA UNIVERSITY,
DEPARTMENT OF NEUROLOGY,
New York, N.Y., January 28, 1974.

Mr. JOHN LEONARD,
Book Review Editor,
New York Times Book Review Section,
New York, N.Y.

DEAR MR. LEONARD: The undersigned have read with interest the book by Dr. Gabriel Nahas, "Marihuana, Deceptive Weed." Dr. Nahas, after thoroughly discussing the scientific, medical and social aspects of marihuana concludes that its usage is quite harmful to man and society. This stand contrasts with that of other authors such as Dr. L. Grinspoon and Mr. E. M. Brecher who minimize the danger of this drug and advocate the legalization of marihuana sales. The books of these authors were favorably reviewed in the Sunday New York Times Book Review Section.

It seems therefore only fair to us that a Review of the book by Dr. Nahas be also published by The Times, so that the other side of the marihuana

story be also presented to your readers. This Review would be especially justified, since recent scientific evidence indicates that marihuana induces cellular damage in man.

Sincerely yours,

WILLIAM M. MANGER, MD, Ph.D.

William A. Blanc, M.D., Professor of Pathology; Robert A. Esser, M.D., Instructor of Psychiatry; Henry C. Frick, M.D., Professor of Clinical Obs. & Gyn.; Allen I. Hyman M.D., Asst. Professor of Anesthesiology; George A. Hyman, M.D., Assoc. Clinical Professor of Medicine; Joannes H. Karls, M.D. Assoc. Professor of Anesthesiology; Donald W. King, M.D., Professor of Pathology; Ferdinand F. McAllister, M.D., Professor of Clinical Surgery; William M. Manger, M.D., Ph.D., Instructor of Medicine; Lester C. Mark, M.D., Professor of Anesthesiology; Kermit L. Pines, M.D., Assoc. Professor of Clin. Medicine; Herbert Rackow, M.D., Professor of Anesthesiology; Ralph W. Richter, Assoc. Clin. Professor of Neurology; Sidney C. Werner, M.D., Professor of Clinical Medicine; Phillip Zeidenberg, M.D., Ph. D., Professor of Psychiatry; and Henry Brill, M.D., Lecturer in Psychiatry, also, Member, National Commission on Marihuana and Drug Abuse.

Senator GURNEY. Thank you. Dr. Nahas. We will now proceed with your statement, if you will, please.

Dr. NAHAS. I am honored to be invited to testify as a scientific witness before this distinguished committee of the U.S. Senate. For the past 25 years I have worked in the laboratory as a physiologist and a pharmacologist, investigating the effects of different drugs on body function. In the past 4 years I have concentrated on studying the biological effects of marihuana products. I was also able to make field surveys in areas of heavy cannabis usage in North Africa. One of these surveys was performed under the sponsorship of the National Institute of Mental Health with Dr. Zeidenberg from Columbia University and Dr. LeFebure from the College de France in Paris. We visited the Rif Mountains of Morocco. We were informed at that time by the Under Secretary of Health of Morocco that heavy marihuana users were more susceptible to tuberculosis which in that area constitutes a major public health problem. This considered opinion from one of our colleagues, along with my own observations which related a condition of general physical deterioration to chronic marihuana smoking, led me to investigate the effects of this drug on the immunity system of man. This immunity is a function of white blood cells, the T-lymphocytes, which specialize in fighting virus infections and destroying substances foreign to the body such as cancer cells or tissue transplants.

With my colleagues, Dr. J. P. Armand, Dr. N. Suciu-Foca, and Dr. Akira Morishima, we studied in our laboratory at the College of Physicians and Surgeons of Columbia University, 51 marihuana smokers, 16 to 35 years of age who had smoked an average of three cigarettes of marihuana a week for 4 years. This study was published in the February 1 issue 1974 of Science and I will not duplicate this study by reading it to you. I will just summarize it and then present to you our latest work.

Senator GURNEY. Is it fair to say that that is a heavy usage of marihuana?

Dr. NAHAS. No, not heavy usage as it has been defined in the Marihuana Commission report or Shafer Commission. Heavy use in the Marihuana Commission report refers to several cigarettes a day. The average amount of cigarettes smoked by these young people were three to four cigarettes of marihuana a week, which would be called rather moderate usage.

These subjects did not use other drugs, although some of them also smoked tobacco and drank alcoholic beverages. We sampled blood from the arm vein of these subjects and isolated their lymphocytes (special white blood cells). These cells were challenged with special substances which normally make them divide and grow. Such a test, the blast transformation test, is presently used to measure the strength or response of the immunity system of the body. We performed this test on marihuana smokers and on control subjects who did not use the weed, but smoked tobacco and drank alcoholic beverages. The immunity response of the marihuana smokers was 40 percent less than that of the nonsmokers. Furthermore, their responses was similar to that of patients with cancer, or kidney grafts—treated with immunosuppressants—who were tested and who presented documented evidence of an impairment of their immunity system. These findings on man were verified on rhesus monkeys studied with Dr. Carolyn Daul in the laboratory of Dr. Robert Heath at Tulane University. These monkeys were made to smoke measured amounts of marihuana several times a week for 3 to 5 months by a technique described by Dr. Heath this morning. We studied the blastogenic response of the lymphocytes of these monkeys and compared them to that of lymphocytes taken from monkeys who were not "smoked". The blastogenic response of the lymphocytes from the monkeys which were smoked was decreased by 52 percent. This was true for the two monkeys which subsequently died in this study.

Mr. MARTIN. Could you define what you mean by blastogenic response?

Dr. NAHAS. I mean that their immunity response as measured by this test was decreased to less than 50 percent of the controlled response in the monkeys which were not smoked.

Mr. SOURWINE. May I ask a question? Do you conclude from this, Dr. Nahas, that marihuana is an immuno-suppressant?

Dr. NAHAS. Well, in the test tube, yes. One cannot, as I will discuss later, one cannot document presently that marihuana smokers present a clinical decrease of their immune response which would be indicated by an increased incidence of virus disease, and of such things as cancer. This we cannot say. The only thing we can say is that the lymphocytes do not respond as normally as, that is to say, as the lymphocytes of subjects that do not smoke marihuana.

Mr. SOURWINE. It is not just a case of not responding normally. I understood you to say it is a 50-percent reduction.

Dr. NAHAS. Yes, in response.

Mr. SOURWINE. It is cut in half?

Dr. NAHAS. That is correct, yes.

Mr. SOURWINE. Thank you.

Dr. NAHAS. We are continuing to study the immune response of these primates with Dr. Heath.

The mechanism of this decrease in the division of lymphocytes was clarified in another series of experiments to be described by Dr. Morishima who showed that these lymphocytes from marihuana smokers could not increase the DNA production required for their proper division. DNA (deoxyribonucleic acid) is the basic chemical contained in the core of all our cells. DNA carries the genetic code and allows each daughter cell to be identical to the mother cell from which they derive.

Mr. SOURWINE. May I bother once more, Mr. Chairman?

I think it will help clarify the record. Is it true, Doctor, as I understand it, that there is and must be an increase in the production of DNA before the cell division takes place?

Dr. NAHAS. That is correct.

Mr. SOURWINE. This is a necessary, a prerequisite, so that what you are saying here is that there was an inhibition of the necessary increase which would have permitted cell division. In other words, this is the basis, the explanation, for the reduction in cell division?

Dr. NAHAS. That is correct.

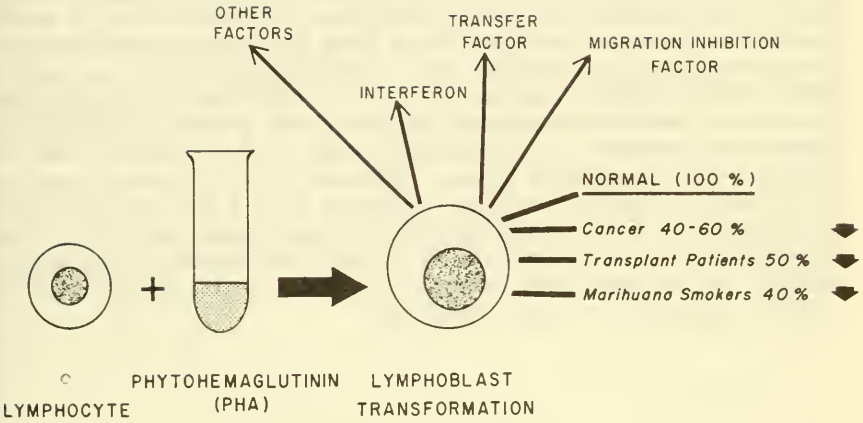
Mr. SOURWINE. Thank you, sir.

Dr. NAHAS. Similar observations were also made on lymphocytes sampled from subjects who did not smoke marihuana. These lymphocytes were incubated in a test tube with very minute amounts of chemicals isolated from marihuana. These lymphocytes presented the same impairment in division and DNA production as those taken from marihuana smokers.

Mr. Chairman, I have prepared several exhibits and I would like to have your permission to enter them into the record.

Senator GURNEY. They may be admitted.

exhibit 1.



Technique used to test the immunity response of man .

Dr. NAHAS. Exhibit 1 is a brief description of the technique used to test the immunity system of a subject. Lymphocytes sampled from the patient are incubated or "cultured" for 72 hours in a test tube with a substance PHA which will cause the cells to increase the formation of DNA and then to divide. This increase is indicated by the growth of the cell in the diagram.

Senator GURNEY. These exhibits are the ones that are attached to your prepared statement?

Dr. NAHAS. That is correct, yes.

Senator GURNEY. They will all be admitted in the record.

Dr. NAHAS. The ability of these cells to increase the formation of DNA may be evaluated by the rate of uptake of radioactive thymidine. Thymidine is a precursor, a building block so to speak, essential for the formation of DNA. Molecules of thymidine can be made radioactive, and the rate at which they are incorporated by the lymphocytes can be measured on a scintillation counter (an instrument which measures radioactivity). You will note that after the lymphocyte has been stimulated to grow it will produce a number of substances, interferon, transfer factor, and so on, which are used to defend our body against disease. Note that if the normal lymphocytes from a group of healthy volunteers have a rate of thymidine incorporation of 100 percent, that of marihuana smokers is decreased by 40 percent. The ability of the lymphocytes of marihuana smokers to produce DNA is similar to that of the lymphocytes of the cells sampled from cancer patients.

EXHIBIT 2

^{3}H - THYMIDINE UPTAKE OF T LYMPHOCYTES IN MARIHUANA SMOKERS COMPARED WITH NORMAL AND IMMUNE SUPPRESSED SUBJECTS

	PHA				MLC			
SUBJECTS	NO. TESTED	CPM	SE	P	NO. TESTED	CPM	SE	P
NORMAL CONTROLS	81	23250	1878		81	26400	1789	
MARIHUANA SMOKERS	51	13779	1195	<0.0005	34	15679	2867	<0.005
CANCER PATIENTS								
PRIMARY TUMORS	16	17501	480	<0.0005	16	14894	3067	<0.0005
REGIONAL SPREAD	23	13345	2533	<0.0005	23	15816	1970	<0.0005
DISTANT SPREAD	21	10516	2594	<0.0005	21	8968	2053	<0.0005
TRANSPLANT PATIENTS					24	12307	1712	<0.0005
UREMIC PATIENTS					26	12001	1360	<0.0005

EXHIBIT 3

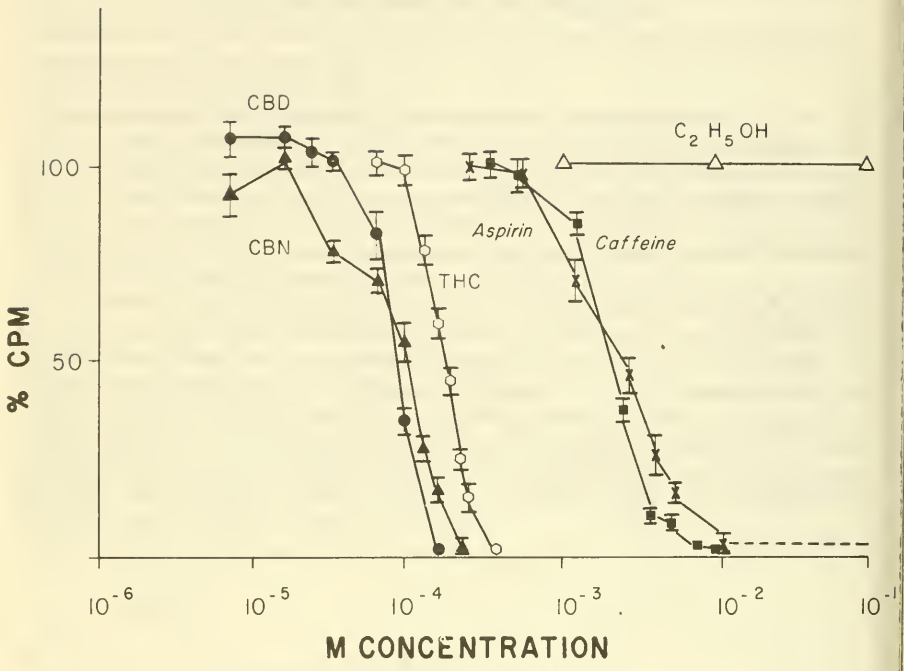
Uptake of H^3-delta-9-THC

by human lymphocytes

(in CPM)

Time	Without PHA	With PHA
1'	487 ± 35	517 ± 39
15'	893 ± 92	903 ± 76
30'	856 ± 61	872 ± 32
60'	651 ± 118	881 ± 22
120'	824 ± 88	822 ± 114
240'	930 ± 215	790 ± 111

exhibit 4



Inhibitory effects of the cannabinoids (marihuana products) delta 9 tetrahydrocannabinol (THC), cannabinol (CBN), cannabidiol (CBD) on PHA induced lymphocyte transformation as measured by ^3H thymidine incorporation after three days of culture. This effect is compared to that of aspirin, caffeine and ethyl alcohol (C_2H_5OH). All experiments were done in triplicate cultures. The counts per minute (CPM) given are the average count of 4 to 5 parallel cultures ± standard error. Inhibition of lymphocyte transformation was calculated in reference to the CPM of the control culture. The dotted line represents % of thymidine uptake of unstimulated cells. A concentration of 10^{-4} marihuana products (THC, CBD, CBN) would correspond to 30 mg, which would be the average amount contained in a 1 gram marihuana cigarette. A concentration of 10^{-1} alcohol would correspond to 5 gm, the amount contained in a glass of wine.

Exhibit 2 details our results as they are actually measured by the scintillation counter, with the figures that we obtained from the counter. In these experiments two different substances were used to stimulate the lymphocytes into growing and dividing. The PHA and the MLC test. Both gave similar results.

Exhibit 3 summarizes an experiment which indicates that one of the most active substances in marihuana, THC, does penetrate into the lymphocytes rather rapidly. This experiment was performed with radioactive THC which was incubated with the lymphocytes. After 15 minutes THC has reached a plateau in the cell.

Exhibit 4 illustrates our latest series of experiments which were performed with Dr. Hsu and Dr. DeSoize. In these experiments, lymphocytes taken from subjects who did not smoke marihuana were incubated with some of the chemical substances isolated from marihuana, THC, CBD, CBN, compounds which were given to us by the National Institute of Mental Health. Of these substances only THC is "psychoactive", impairs psychomotor performance, and is considered the major biologically active substance of marihuana. In this experiment it is made clear that not only is THC immuno-suppressive but that also the two nonactive substances in marihuana, CBN and CBD have a similar effect. As a matter of fact, it seems that these nonactive substances have a greater potency to inhibit DNA formation in the lymphocytes than does THC.

Mr. Sourwine. Mr. Chairman, for the sake of the record, might I inquire? You used the phrase nonactive substances. You really mean substances formerly deemed to be nonactive and you now have proved they are active, is that correct?

Dr. Nahas. Yes. Such an experiment comes as no surprise to Dr. Paton, who has repeatedly emphasized that THC was only one of the many substances in marihuana to change cellular function. Note that the potency of these cannabis products to impair the production of DNA by lymphocytes is about 50 times greater than that of aspirin and caffeine, and note also that it takes concentrations 10,000 times greater for alcohol (C_2H_5OH). And even with sufficient concentrations 10,000 times greater there is no effect on cell division. Therefore, as far as DNA formation and cell division is concerned alcohol has very little effect in this experiment as already mentioned by Dr. Paton.

Senator Gurney. Doctor, at this point for the sake of the record, would you define what the chemical substance CBD, and CBN are?

Dr. Nahas. Yes. CBN is cannabinol and CBD is cannabidiol. These two substances are present in the leaves and flowering tops of cannabis, and in the so-called low quality "grass" the concentration of CBN is quite high while that of THC is low. And it is interesting to note that insofar as DNA production is concerned, even some people who smoke low grade marihuana might still impair their lymphocytes. Now, on this chart——

Mr. Sourwine. Forgive me, please, I have become confused and if I may be permitted, may I ask two questions? You have said that the potency of these cannabis products to impair the production of DNA by lymphocytes is 50 times greater than that of aspirin and caffeine. In other words, it takes 50 times as much aspirin or caffeine as it does THC to cause the impairment. And then you

say it takes concentrations 10,000 times greater for alcohol to have an effect.

So that we can understand this, how much alcohol is involved in a concentration 10,000 times greater than the amount of cannabis which will impair the production of DNA by lymphocytes?

Dr. NAHAS. Well, such concentrations are never reached in the bloodstream of man, they would amount to 5 percent of alcohol. The highest concentration is, I think, 1 percent—no, the concentration of alcohol which is associated with intoxication is 50 milligrams percent. And I say that the concentration we use in this experiment is in excess of 500 milligram percent. So 10 times more than what is considered a state of intoxication.

Mr. SOURWINE. You mean in order to have this kind of an effect on the formation of DNA by the lymphocytes it would take a concentration of alcohol in the blood of 50 percent?

Dr. NAHAS. No, 500 milligrams percent that is 500 milligrams of alcohol in 100 milliliters, or $\frac{1}{10}$th of a liter of blood.

Mr. SOURWINE. 500 milligrams percent?

Dr. NAHAS. 500 milligrams percent or more.

Mr. SOURWINE. Would inhibit it?

Dr. NAHAS. This would result in the death of the subject.

Mr. SOURWINE. The percent of cannabis products which will inhibit it must be almost infinitesimal, 1/10,000's of that, is that right?

Dr. NAHAS. That is right.

Mr. SOURWINE. A mere trace in the blood.

Dr. NAHAS. Well, more than a trace, something which can be measured.

Mr. MARTIN. How many milligrams would be involved?

Dr. NAHAS. Well, to give you an idea, a marihuana cigarette, contains an amount of cannabinoids—cannabis products—corresponding to 10 to the minus 4—about 30 milligrams.

Senator GURNEY. We are talking about exhibit 4?

Dr. NAHAS. Yes.

Mr. MARTIN. State that.

Dr. NAHAS. 30 milligrams of cannabis products—of THC and other marihuana constituents.

Mr. SOURWINE. You cannot translate milligrams into the blood. If it takes 5 percent alcohol in the blood to cause this damage and 1/10,000's amount of that, then 5/10,000's of cannabis products must be enough in the blood to cause the damage, is that right?

Dr. NAHAS. Well, Mr. Chairman, these experiments are experiments which are made in vitro, in the test tube.

Mr. SOURWINE. I am not challenging you, sir, I am only seeking light. We have these figures here, 50 times, 10,000 times, and I am trying to relate them.

Dr. NAHAS. Well, it is easy to relate them in the test tube because the volume there is small and exact concentration of these substances can be measured. However, in the body, especially for cannabis products, it is very difficult to measure the exact amount which is at any time in the plasma.

Mr. SOURWINE. Then, your 10,000 times is not a direct relationship to the percentage needed in the blood. Your 10,000 times is related to the actual amount in concentrated form in the test tube?

Dr. NAHAS. That is right, yes.

Mr. SOURWINE. All right. I have no further questions, Mr. Chairman.

Senator GURNEY. Proceed.

Dr. NAHAS. But what I want to say is that the concentration of THC, CBD, and CBN which in the test tube inhibits DNA formation, is reached in the plasma of man, if you refer yourself to the studies, to the few studies, where plasma concentrations of cannabinoids are available.

Now, it would, therefore, appear that lymphocyte production of DNA as measured by the incorporation of ^{3}H thymidine is impaired by marihuana products. The ability of delta-9 THC and of other cannabinoids to limit ^{3}H thymidine incorporation by lymphocytes in cell culture, although not previously described, is consistent with some of the characteristics of these compounds which are not soluble in water and accumulate in fat. The reduced incorporation of ^{3}H thymidine after exposure of the lymphoctyes to concentration of cannabinoids which may be reached during chronic cannabis consumption could decrease body defenses as claimed by some of our colleagues in North Africa. Such an outcome would be damaging when it is desirable that these defense mechanisms remain intact as in the cases of cancer and other poorly understood diseases. The clinical significance of these observations can only be assessed by what are called "epidemiological investigations". These investigations, patterned after the "Framingham studies" of tobacco smokers, are exceedingly expensive; they would have to be carried out on a large population of marihuana smokers to be studied year after year for several decades. In this investigation an appraisal of the immune response of the marihuana user should be systematically studied so as to better appreciate the development of the many different pathological conditions in which the immune system plays an important role.

However, these observations, taken in the general context of the damaging effect of marihuana on the DNA of dividing cells, are indicative that long-term marihuana usage by a significant fraction of the American population would constitute a major public health problem.

Thank you, Mr. Chairman.

Senator GURNEY. Thank you, Doctor.

As I understand it then, not being a scientist, I am not sure I understood what all these figures mean, but I think I understand what you are saying, that is, the use of marihuana severely reduces the user's, a user's resistance to disease in sickness, is that another word for it?

Dr. NAHAS. Well, that is what it might do in the long run. Actually, what we have shown is that the use of marihuana decreases the ability of the cells to fulfill their function of dividing rapidly. The lymphocytes are cells which have to divide rapidly whenever the body is attacked by a virus, for instance. In marihuana smokers we found that these lymphocytes do not divide as rapidly as well as those sampled from people who did not smoke marihuana. But we have not made an epidemiological study which would be required to correlate a higher incidence of all types of disease with length of the

marihuana smoking, similar to those which have been done with tobacco smokers.

It is only in the past 12 years that tobacco smoking has been correlated with cancer, heart disease and other unhealthy conditions. Before that there was no physical evidence that such a correlation existed, although it did exist in fact.

Senator GURNEY. But the inference is that use of marihuana makes people more susceptible to illnesses without defining all the various illnesses?

Dr. NAHAS. That is an inference which only further studies would be able to determine.

Senator GURNEY. Yes.

Mr. MARTIN. In the study just reported you collaborated with three senior scientists of the College of Physicians and Surgeons of Columbia University. We are going to introduce Dr. Morishima, who was one of your collaborators. Could you tell us something briefly about the qualifications of your other two collaborators?

Dr. NAHAS. Dr. Suciu-Foca is an immunologist and is chief of the Laboratory of Clinical Immunology of the College of Physicians and Surgeons. She has a world-known reputation, especially in the techniques that we used and which she has perfected.

Dr. Jean Pierre Armand is also an immunologist and he is associate director in the Cancer Institute of the University of Toulouse in France.

Mr. MARTIN. So these were all eminently qualified scientists who worked with you?

Dr. NAHAS. Yes. Such a study required many different disciplines and in order for these studies to be valid one has to work in conjunction with very competent people in different specialties.

Mr. MARTIN. In order to clarify a point about which I feel there may have been some misunderstanding, I would like to suggest the advantage of trying to transfer from percentages to quantities. Would it be roughly accurate that in order to get intoxicated on whiskey you need 10 to 15 ounces?

Dr. NAHAS. I beg your pardon?

Mr. MARTIN. Ten to 15 ounces, a third to half a bottle to get intoxicated with whiskey——

Dr. NAHAS. Yes——

Mr. MARTIN [continuing]. Roughly.

Dr. NAHAS. Yes.

Mr. MARTIN. Or 8 to 15 ounces.

Dr. NAHAS. Yes.

Mr. MARTIN. Certainly, 1 ounce would not do it.

How much THC do you need to get yourself stoned?

Dr. NAHAS. Well, in terms of ounces a very small percent of an ounce, I would say 10 milligrams.

Mr. MARTIN. Ten milligrams.

Dr. NAHAS. That is about one thousandth of an ounce.

Mr. MARTIN. About one thousandth of an ounce?

Dr. NAHAS. About one thousandth of an ounce, I would say.

Mr. MARTIN. So that 1 ounce of pure THC would be enough for——

Dr. NAHAS. One thousandth of an ounce, I beg your pardon.

Mr. MARTIN. One thousandth of an ounce?

Dr. NAHAS. Yes.

Mr. MARTIN. So that 1 ounce of pure THC would be enough for 1000 intoxications. We are talking about two substances——

Dr. NAHAS. Yes.

Mr. MARTIN [continuing]. Whose capacity for intoxicating people is really poles apart. I mean, you need a tiny, tiny amount in one case and a fairly large amount in the other case?

Dr. NAHAS. That is correct.

Mr. SOURWINE. With great respect, in intoxication a high is not necessarily the same thing as the inhibition against production or the formation of DNA you testified about earlier. A man may get drunk on alcohol without any inhibition of the formation of DNA?

Dr. NAHAS. That is right.

Mr. SOURWINE. I mean, as I understand it, he cannot get a high on pot without some measure of such inhibition?

Dr. NAHAS. Without, well, over a period of time, that is true, yes.

Mr. SOURWINE. All right.

Dr. NAHAS. You can take a drink every evening and not impair your DNA, that is correct. But you cannot smoke a marihuana cigarette every day and not run the risk of impairing DNA in some of your dividing cells.

Mr. SOURWINE. Yes, sir.

Mr. MARTIN. Dr. Nahas.

Dr. NAHAS. Yes.

Mr. MARTIN. I believe you have stated that your research raised the possibility of serious genetic damage if the cannabis epidemic remains unchecked. Would you like to comment on that, or would you like to leave that for Dr. Morishima?

Dr. NAHAS. I think Dr. Morishima is much more competent than I in that.

Mr. MARTIN. Does the amount of cannabis being consumed in the United States today—that is, based on rough calculations which, in turn, are based on what we know about the quantities interdicted by the Federal authorities—does the amount being used justify the term "epidemic"?

Dr. NAHAS. Well, certainly, it does since I think you calculated that about 50 cigarettes containing 10 milligrams THC have been consumed in 1973 by every single citizen of the United States, including newborns.

Mr. SOURWINE. You mean a quantity equal to 50 cigarettes per person has been consumed?

Dr. NAHAS. Well, upon that basis it certainly is an epidemic.

Mr. SOURWINE. It is a different thing from saying that everybody in the country has consumed 50 marihuana cigarettes.

Dr. NAHAS. I agree.

Mr. MARTIN. Point conceded. You have in recent years, Dr. Nahas, attended a number of national and international conferences on cannabis research?

Dr. NAHAS. Yes.

Mr. MARTIN. Roughly, how many would you say you have attended?

Dr. NAHAS. Four or five, maybe a half-dozen. There have been many.

Mr. MARTIN. Has there been any discernible trends at these conferences? Would you be prepared to venture an estimate on the percentage of the scientists at these conferences who lean toward the conclusion that marihuana is relatively harmless and the percentage whose findings have convinced them that it is a very dangerous drug?

Dr. NAHAS. Well, I think Dr. Paton did answer this question in a very appropriate fashion and I would certainly agree with what he said. You see, the scientist is essentially a human being who is swayed by public opinion like any other human being. Before 1960 the majority of scientists had all agreed marihuana was dangerous, very much so, and then came this great new wave of marihuana use and public opinion did change and then in some respect it did influence the opinion of the scientists, because the facts did not. We were told 4 or 5 years ago that marihuana was harmless but there was no hard fact to support this contention, and there was a very strong body of historical evidence indicating that it was very harmful. But many people were swayed by this new fashion. So I think that the opinion of scientists is very much influenced by the fashion in which they live. Your question is difficult to answer.

Mr. MARTIN. When we talk about historical evidence, what you are saying in effect is that over the centuries wise men in many countries have been very critical of cannabis, and have warned against its use, even though they did not have the advantage of modern scientific technology?

Dr. NAHAS. That is correct. Yes.

Mr. MARTIN. This was based on empirical observations?

Dr. NAHAS. Yes, and they still do. I am sure in the countries which I visited, in Morocco and elsewhere, they will never find by themselves evidence for the physical damage that cannabis has produced in their population because they do not have the tools to do it. But still they believe that it is most harmful.

Mr. MARTIN. What you are saying, if I understand your remark, Dr. Nahas, is that the mere fact that Shakespeare did not have a degree in psychology from Harvard does not mean that Shakespeare was ignorant of human psychology?

Dr. NAHAS. That is correct.

Mr. MARTIN. Coming closer to the present, it is accurate that an international scientific conference convened in 1924 under the auspices of the League of Nations, voted unanimousy to list cannabis as a dangerous substance and they voted to cooperate with each other in seeking to eradicate it?

Dr. NAHAS. Yes.

Mr. MARTIN. Did the scientists who attended this conference have the hard scientific evidence that we have today?

Dr. NAHAS. None at all. As a matter of fact, this conference had to be prolonged because some of the officials from the west who attended the conference asked the Egyptian delegate to present them with hard facts indicating that marihuana was harmful and he could not find any.

Mr. MARTIN. In short, their vote was based primarily on these centuries of empirical observations to which you referred earlier?

Dr. NAHAS. That is correct.

Mr. MARTIN. You do not feel they were wrong in voting as they did, despite the lack of hard scientific evidence?

Dr. NAHAS. Yes.

Mr. MARTIN. If the United States ever legalized marihuana, what is your judgment of the effect this would have in the United States and internationally?

Dr. NAHAS. Well, it is difficult to predict what would happen. I think that Dr. Bejerot will tomorrow discuss this problem and he is pretty well qualified for it.

I can just convey to you a feeling, impressions and opinions of the Public Health officials in the North African countries I visited. These public officials are convinced that marihuana usage is harmful to their people and to the society, to the social structure in which they live. They want the help of the United States to give them funds in order to produce substitute cash crops instead of marihuana, which constitutes the only cash crop in some areas of Morocco. So when you inform these officials that there is a probability or possibility that marihuana might be legalized in the United States, and you say that it could be made commercially available, they look at you with great incredulity.

Mr. MARTIN. A final question. Has your research been funded by any Government agency or is it privately funded?

Dr. NAHAS. It is privately funded.[1]

Mr. MARTIN. You have obtained no Government funds?

Dr. NAHAS. Until now I have not obtained any Government funds, and it is a very expensive venture.

Mr. MARTIN. Did you apply for Government funds?

Dr. NAHAS. I did.

Mr. MARTIN. Your application was apparently rejected?

Dr. NAHAS. But it is being now reconsidered.

Mr. MARTIN. Thank you.

Dr. NAHAS. It was rejected, yes.

Mr. MARTIN. I have no further questions, Mr. Chairman.

Senator GURNEY. When did you first apply for Government funds, Doctor?

Dr. NAHAS. I first applied last October when I had assembled a body of knowledge sufficient to indicate that there was a certain area in my research where interesting and fruitful information could be found.

Senator GURNEY. And this application is still pending?

Dr. NAHAS. We are reapplying.

Senator GURNEY. Mr. Sourwine.

Mr. SOURWINE. I have two questions, Mr. Chairman.

Doctor, at the conclusion of your statement you said that your observations taken in the general context of the damaging effect of marihuana on the DNA of dividing cells are indicative that long-term marihuana usage by a significant fraction of the American population would constitute a major public health problem.

Would you tell us what you consider to be a significant fraction? 5 percent, 10 percent, 20 percent?

[1] Mostly from a gift from Mr. Henri G. Doll and one from the Phillipe Foundation.

Dr. NAHAS. No, I said that it would be, it might be a small percentage. I think that in a population at large there is only a relatively small percentage, let us say, to be kind, 12 percent, which is active, creative, and which is responsible for much of the creativity in the society. If just a small percentage of this 12 percent, let us say, 2 or 3 percent falls off this would create a very serious problem already.

Mr. SOURWINE. Well now, when you use a general figure like "significant percentage" you are talking about a percentage of the whole population, not a percentage of some elite group, are you not?

Dr. NAHAS. That is correct. But I am——

Mr. SOURWINE. What percentage of the whole population constitutes a significant fraction of the population, in your opinion?

Dr. NAHAS. Well, a fraction which is statistically significant, so this may not be very high, I would say it is 5 or 10 percent.

Mr. SOURWINE. Well, how many, what percentage of the American population are now using marihuana?

Dr. NAHAS. The figures are, I think, between 10 and 15 percent.

Mr. SOURWINE. Then, we are now in a situation in which marihuana constitutes a major public health problem, is that right?

Dr. NAHAS. I think it does; well, this is my personal opinion.

Mr. SOURWINE. That is all I am asking for.

Dr. NAHAS. If marihuana will continue to be consumed in the United States at the rate at which it was consumed in 1973 on the basis of the figures which were given to us, I think that in 10 years it will be a major public health problem, yes.

Mr. SOURWINE. You are a very careful man in your statements, sir, which I am sure is the proper scientific attitude, and I mean no offense by this question. You have told us that in order to have appropriate and normal resistance to disease, lymphocytes must divide quite rapidly in case of an invasion. You have told us that the use of marihuana inhibits this division by approximately 50 percent through the inhibition of the production of the deoxyribonucleic acid, am I correct so far?

Dr. NAHAS. Yes.

Mr. SOURWINE. Then, you declined to make a judgment that this meant that the use of marihuana reduced the resistance of the user to disease. Is that not a little bit like saying if you introduce into the blood a noncoagulating factor to the extent that the blood will seep through the tissues, there is still no assurance that the man is going to bleed?

Dr. NAHAS. Well, I have to keep toeing the scientific line which says that as long as there is no evidence you cannot conclude.

Mr. SOURWINE. All right, sir, I have no more questions.

Senator GURNEY. It is my understanding, just to complete the last line of questioning, that there have not been that, there has not been that much experimentation to actually prove that marihuana, the use of marihuana prevents resistance to certain diseases because it has not been experimented, is that not what you are saying?

Dr. NAHAS. There have not been enough actual observations. But if I were to bet personally, I would certainly bet that the incidence of disease in chronic marihuana smokers would be much greater than in those who do not smoke marihuana. I would make that hypothesis, I would bet on it.

Mr. SOURWINE. Thank you, Doctor.

I understand our next witness is Dr. Morishima. Doctor, will you identify yourself for the record, please?

TESTIMONY OF DR. AKIRA MORISHIMA, COLUMBIA UNIVERSITY

Dr. MORISHIMA. I am an associate professor of the department of pediatrics of the College of Physicians and Surgeons at Columbia University. I am the chief of the division of pediatric endocrine service at Babies Hospital.

Senator GURNEY. Perhaps if you do not mind, I could ask some questions which will start us in at the beginning and establish your qualifications, Doctor.

Dr. MORISHIMA. Yes, sir.

Senator GURNEY. You were born in Tokyo in 1930?

Dr. MORISHIMA. That is correct, sir.

Senator GURNEY. You are currently a citizen of the U.S.?

Dr. MORISHIMA. Yes, I am.

Senator GURNEY. And you received your medical degree from the School of Medicine, Keio University in Tokyo in 1954?

Dr. MORISHIMA. That is correct, sir.

Senator GURNEY. And you subsequently received a Ph. D. in medicine from Keio University for your work in the field of cytogenetics.

Dr. MORISHIMA. Yes, Mr. Chairman.

Senator GURNEY. How would you define cytogenetics?

Dr. MORISHIMA. It is a discipline in which genetics of cells are studied.

Senator GURNEY. And you have been associated with Columbia University from 1956 to the present time—apart from a 2-year stint, from 1966 to 1968 as assistant professor of pediatrics at the University of California in San Francisco?

Dr. MORISHIMA. That is correct, sir.

Senator GURNEY. And you have served as pediatrician or pediatric consultant at a number of major New York hospitals?

Dr. MORISHIMA. Yes, I do.

Senator GURNEY. And you have for several years been a member of the endocrine disease advisory committee of the New York City Department of Health?

Dr. MORISHIMA. Yes, I am.

Senator GURNEY. And you are the author or coauthor of 32 scientific papers, with a heavy emphasis in the field of cytogenetic research?

Dr. MORISHIMA. That is correct, sir.

Senator GURNEY. Is it accurate to say you are basically a geneticist?

Dr. MORISHIMA. Yes, who specializes in the subdivision of cell genetics, if you will.

Senator GURNEY. Very well. Will you proceed with your statement, Doctor?

Dr. MORISHIMA. Mr. Chairman, I am honored to be invited to testify as a scientific witness before this distinguished committee.

During the past few years, I have been examining the cytogenetic changes in heroin addicts. My interest in cannabis originally stemmed from this study. The vast majority of heroin addicts we were able

to study smoked marihuana, at least on occasions, and therefore it became important to examine separately the effects of marihuana smoking. It is of interest that the preliminary observation on marihuana smokers suggests that some cytogenetic changes in these subjects are dissimilar to those found in heroin addicts.

We obtained lymphocytes from peripheral blood of heavy marihuana smokers—at least once per week for minimum of 1 year—and cultured the cells in vitro for 72 hours, stimulated by phytohemagglutinin, PHA. At the end of this culture period, cells were exposed to colchicine and a hypotonic solution, then, were fixed, all in a rigidly prescribed manner. This method is a standard technique used for examination of human chromosomes, and is commonly employed in diagnosis of diseases caused by chromosomal aberrations. The method is very similar to that used for detection of chromosomal breakages in marihuana smokers by Dr. Stenchever [1] and in users of lysergic acid diethylamide, LSD, by Dr. Cohen [2] and his associates in 1967.

When the specimens of three marihuana smokers were compared with those of age and sex matched nonsmokers, the mitotic index, or the proportion of those cells in process of cell division, was noted to be only 2.3 percent in marihuana users, compared with 5.9 percent for the controls. Although the significance of this difference was not clear due to the small number of subjects studied, it suggested that activity of cell division may be decreased in marihuana smokers.

However, in the marihuana samples, we noted that a large proportion of metaphase nuclei contained a significantly decreased number of chromosomes than the normal human complement of 46 chromosomes. Metaphase is a brief stage of cell division during which each chromosome is clearly visible.

[The table follows:]

MITOTIC INDEX

	Number of subjects	Mitotic Index (percent)	Number of cells examined
Marihuana smokers	3	2.37	60,173
Controls	3	5.94	59,000

LABELED CELLS BY USE OF H^3-THYMIDINE DURING THE 50 HOURS OF CULTURE

	Number of subjects	Labeled cells [1] (percent)	Total cells examined
Marihuana smokers	3	10.44	1.245
Controls	3	29.81	1.631

[1] More than 10 grains per cell.

Mr. Chairman, I have prepared several figures. I should like to refer to Exhibit 1.

Senator GURNEY. These will all be admitted in the record.

[1] Stenchever M. A.; Kunysz, T. J., and Allen, M. A. "Chromosome Breakage in Users of Marihuana." Am. J. Obs. Gyn., 118: 106, 1974.

[2] Cohen, M. M.; Marinello, M. J., and Back, N. "Chromosomal Damage in Human Leukocytes Induced by Lysergic Acid Diethylamide." Science, 155: 1417, 1967.

EXHIBIT 1

Dr. MORISHIMA. In exhibit 1 a normal metaphase cell with 46 chromosomes is shown in the left upper corner. Cells with 38, 24, 11, and 8 chromosomes, respectively, are shown in the remainder of this figure.

Mr. SOURWINE. What is the significance of a cell with 34 or 11 or 8 chromosomes?

Dr. MORISHIMA. These are abnormal cells which are seen only in a very small percentage among the normal controls.

Mr. SOURWINE. Will they take part in reproduction?

Dr. MORISHIMA. They probably will, at least for one or two cell generations but after that I have no evidence to support whether or not they can or cannot.

Mr. SOURWINE. Thank you.

Dr. MORISHIMA. In exhibit 2, I have summarized the study.

In marihuana smokers, 30.6 percent of the cells examined had 5 to 30 chromosomes, whereas only 7 percent of cells were found to have such a chromosomal complement in the control group. The small percentage of abnormal cells in normal individuals is thought to arise during the process of preparing the slides, and is considered a technical artifact. However, in marihuana smokers, the incidence of metaphase cells missing a large number of chromosomes was over fourfold greater than that in controls. This incidence was so high that I have not encountered a comparable phenomenon in any other clinical situations in 15 years of experience in cytogenetics. Judging from the microscopic findings, there were reasons to believe that this observation could not be explained merely on the basis of technically induced artifacts. Although this study included only a few patients, and is still incomplete due to lack of funds, I believe that the data are sufficient to suggest that marihuana smoking results in severe

EXHIBIT 2

PERCENTAGE OF METAPHASES WITH VARYING NUMBER OF CHROMOSOMES					
NUMBER OF CHROMOSOMES	1-4	5-10	11-20	21-30	over 30
CONTROL	3.17	3.17	3.17	4.76	85.71
	5.17	3.02	2.26	2.64	86.88
	0.00	1.00	0.00	1.00	98.00
mean	2.78	2.40	1.81	2.80	90.20
			7.01		
			METAPHASES COUNTED 954		
MARIHUANA SMOKERS	7.57	8.33	9.84	21.96	52.27
	2.11	7.74	7.74	25.35	57.04
	5.44	4.26	1.47	5.29	83.52
mean	5.04	6.78	6.35	17.53	64.28
			30.66		
			METAPHASES COUNTED 956		

disruption of the normal process by which chromosomes segregate into succeeding generations of cells, at least when cultured in vitro.

Dr. Nahas has already mentioned the decreased ability of lymphocytes obtained from marihuana smokers to synthesize DNA in culture. In this regard, I should like to mention a study which confirmed his observation. Tritiated thymidine, which is a radioactive precursor of DNA, was added to the culture medium of lymphocytes for 50 hours in this experiment. After washing the cells to remove any radioactive thymidine not already incorporated into the cells, the specimens were placed on slides. Photographic films were then placed in contact with the cells so that the incorporated radioactivity could be observed by use of a microscope—autoradiograph. In marihuana smokers only 10.4 percent of all cells were found to have incorporated the tritiated thymidine, in contrast to 29.8 percent for the nonsmokers. This observation suggests that a larger proportion of lymphocytes of marihuana smokers is incapable of cellular reproduction in vitro.[1]

It is of interest that the apparent decrease in mitotic index and diminished DNA synthesis of the lympocytes of marihuana users is very different from the cytogenetic findings obtained in heroin addicts.

As summarized in the third exhibit, the mean mitotic index of lymphocytes obtained from heroin addicts was 11.8 percent, significantly greater than that of controls, with a mean index of 6.6 percent. Since most of the addicts were also users of marihuana, it may be speculated that their mitotic index would have been even greater if they had not smoked marihuana.

Senator Gurney. I wonder, so we can understand as laymen now perhaps you had better say for the record, Doctor, what do you mean by in vitro and what do you mean by in vivo?

Dr. Morishima. Mr. Chairman, in vitro here I refer to in-test-tube situation. In vivo, I mean, in life.

Senator Gurney. Life.

Dr. Morishima. May I proceed?

Senator Gurney. Yes.

Dr. Morishima. Since lymphocytes constitute an essential component of cellular immunity and chromosomes are basic units of inheritance at the cellular level, it seems logical to anticipate potential danger in immune defense system, development of cancer, germ cell production, genetic mutation and birth defects. Unfortunately, little is known of the effects of cannabis in these areas. Many of these can be examined systematically and rapidly utilizing the presently available technology. On the other hand, it is prudent to keep in mind possibilities of long-term effects which can be studied only by long-range epidemiological investigations. It was only 2 years ago that diethylstilbesterol, once a commonly prescribed female hormone, was implicated in vaginal cancer of female offspring of mothers who were treated with this agent some 15 to 20 years before.

Thank you, Mr. Chairman.

In exhibit 4, the results of the in vitro study is shown.

When lymphocytes obtained from 11 normal subjects were exposed to morphine sulfate of various concentrations in culture, a complete

[1] Nahas, G. G.; Suciu-Foca, N.; Armand, J. P. and Morishima, A. "Inhibition of Cellular Mediated Immunity in Marihuana Smokers." Science 183: 419, 1974.

inhibition of DNA synthesis occurred at 1.32×10^{-1} mM. This concentration is estimated to be about 100 times the concentration found in the blood of fatalities from acute overdoes of morphine. At concentration of 1.32×10^{-7} mM an enhancement of DNA synthesis was observed. This concentraion is approximately 1/1000 of the blood concentration of fatalities. Thus, in contrast to cannabis, derivatives of opium alkaloids appear to stimulate DNA synthesis and cell division of lymphocytes in culture at an appropriate concentration.[1]

Considering the various studies of Drs. Stenchever, Leuchtenberger [2] and Nahas together with the data presented, I believe that we can conclude that there is an increasing body of evidences to suggest that cannabis can affect the process of cell multiplication and induce profound cytogenetic changes. While these in vitro studies do not directly indicate adverse effects in vivo, they do implicate potential health hazards.

EXHIBIT 3

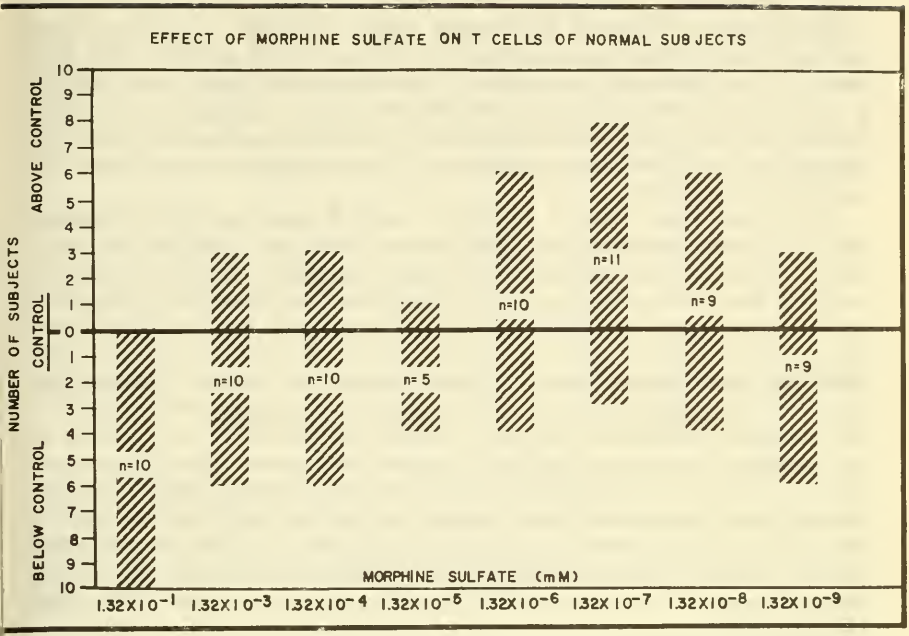
MITOTIC INDICES IN CULTURED LYMPOCYTES OF HEROIN ADDICTS

CONTROLS			ADDICTS		
SUBJECT	TOTAL CELLS EXAMINED	MITOTIC INDEX (%)	SUBJECT	TOTAL CELLS EXAMINED	MITOTIC INDEX (%)
A.M.	2400	13.07	A.H.	2400	20.25
V S	2563	3.45	L.D.	2114	16.65
A.M.	2338	4.40	E.R.	3665	9.95
S.B.	2788	6.92	W.J.	9329	5.46
M.C.	12,770	7.78	S.T.	7398	8.20
Sc.B.	10,000	4.86	C.B.	8600	17.83
S.D.	10,000	5.66	N.S.	9000	4.82
A.M.	8991	8.26	S.C.	8486	10.74
W.H.	7480	4.90	M.P.	8493	12.68
		6.59 ± 0.970(S.E.)%			11.82 ± 1.827(S.E.)%
					P < 0.05

[1] Milstein, M.; Morishima, A.; Cohen, M. I. and Litt, I. F. Effects of Opium Alkaloids on Mitosis and DNA Synthesis. Ped. Res. 8: 118, 1974 (Abstract).

[2] Luctenberger, C.: Leuchtenberger, R. and Schneider, A. Effects of Marihuana and Tobacco Smoker on Human Lung Physiology. Nature, 241: 137, 1973.

EXHIBIT 4



Senator GURNEY. Thank you, Doctor. I guess I should have perhaps asked each of the panelists about this but let me direct a question to you. I take it, really, there has not been that much study on the effects of marihuana, is that true?

Dr. MORISHIMA. Not in the chromosomal level, as far as I know. There is Dr. Stenchever's work, the one which came out from the Jamaica study and the one I presented to you just about summarize the current knowledge.

Senator GURNEY. Is it true—and I am asking this question also of the other panel members in the areas they have been investigating—there really has not been much research done on marihuana and its effects?

For the record, I will say each of the panelists shook their heads in the affirmative—no, there has not been that much research done.

Mr. Counsel, do you have any questions?

Mr. MARTIN. Just a few questions. I would like to ask Dr. Morishima to respond to the questions as briefly as possible in the interest of time, and I would like to ask the two remaining witnesses when they testify if they will perhaps abbreviate their prepared remarks somewhat, and also to make their replies to questions as brief as possible so that we can wind up the hearing this afternoon.

Dr. Morishima, if I understood you correctly, what brought you together with Dr. Nahas and his research on marihuana, in which you

joined him, was your earlier studies on the cytogenetic effects of heroin?

Dr. MORISHIMA. That is correct, sir.

Mr. MARTIN. I would like to ask you to amplify on your closing statement in which you mention the effect of diethystilbesterol. You said, if I understood you, to be prudent we must keep in mind the possibilities about the long-term effects—about which we will only learn from long-range investigations in the future. Do you mean that the effects may not be noticeable in this generation or perhaps for another generation?

Dr. MORISHIMA. That is precisely what I mean in this statement, sir. For example, when diethystilbesterol was used during the pregnancy of the mother who was carrying the female offspring, the effect was not seen in the mother at all. She never expressed adverse effect, and it was only when the female offspring reached beyond the puberal age, cancer of the vagina was discovered and diethystilbesterol was then implicated in production of this cancer. So I believe that similar kinds of situations can occur in the marihuana usage. Particularly I am concerned with the fact that marihuana seems to accumulate in the gonads, that is, ovaries and the testicular tissue. And I am particularly concerned about the ovaries rather than the sperms because the ovaries contain a finite number of eggs at the time of female birth. They do not increase, they die progressively. They are endowed with a definite number of eggs which cannot be reproduced. So if a damage is done one can shed those damaged cells year after year after puberty.

Mr. MARTIN. You said that your personal research in other areas tended to supplement and confirm the research which you have conducted jointly with Dr. Nahas. Who funded this personal research to which you referred? Were you able to find Government support for your work, or foundation support, or private support?

Dr. MORISHIMA. I am totally unfunded in terms of marihuana research at the moment. However, I do have a contract with the city of New York to investigate cytogenic changes in heroin addicts and, therefore, I am allowed under the agreement to undertake certain pilot studies which are relevant to the heroin addiction.

Mr. MARTIN. Have you applied—submitted an application—for research support?

Dr. MORISHIMA. I applied to NIH in conjunction with Dr. Nahas.

Mr. MARTIN. And it was this application which was turned down and is apparently now being considered?

Dr. NAHAS. Resubmitted.

Mr. MARTIN. Resubmitted. Thank you very much. I have no further questions, Mr. Chairman.

Mr. SOURWINE. Just one, Mr. Chairman.

Dr. Morishima, in telling us about the effect of heroin and other opium alkaloid derivatives upon DNA synthesis preceding cell division, you brought into my mind this understanding and I want to ask you if it is correct. Heroin and marihuana differ greatly, perhaps most greatly in the fact that heroin and other opium alkaloid derivatives can totally inhibit the cell division—a bad effect—in heavy concentrations but may actually increase it or stimulate it—a good effect—

in sufficiently small concentrations, whereas there is no quantity of marihuana that does any good, all of it does harm?

Dr. MORISHIMA. Counsel, I do not want to imply increased DNA synthesis, per se, is good. If one takes that position we must glorify leukemia as a good disease and, therefore, being variations from the normality to me is bad either way. All I am saying is that with heroin there is an increase in DNA synthesis, and in marihuana there is a decrease. In test tube situation, at least, if you give enough you can kill off the cells with the morphine sulfate, which is not a surprise. You can kill cells with almost anything; if you give high enough concentration, sugar will do it, sir.

Mr. SOURWINE. I thank you. No further questions, Mr. Chairman.

Senator GURNEY. Thank you, Dr. Morishima.

Our next witness is Dr. Robert Kolodny.

Dr. Kolodny, would you identify yourself for the record?

TESTIMONY OF DR. ROBERT KOLODNY, REPRODUCTIVE BIOLOGY RESEARCH FOUNDATION, ST. LOUIS, MO.

Dr. KOLODNY. I am Dr. Robert C. Kolodny of the Reproductive Biology Research Foundation in St. Louis, Mo.

Senator GURNEY. Let me ask just a few questions on your qualifications, Doctor. I understand you received your medical degree in 1969 from the Washington University School of Medicine in St. Louis?

Dr. KOLODNY. That is correct.

Senator GURNEY. And you served, you have served since 1973, as director of the endocrine research section of the Reproductive Biology Research Foundation in St. Louis?

Dr. KOLODNY. That is correct.

Senator GURNEY. And you have also served since last year as instructor in the department of medicine of the Washington University School of Medicine?

Dr. KOLODNY. Yes, sir.

Senator GURNEY. You are a captain in the U.S. Army Medical Corps Reserve?

Dr. KOLODNY. Yes, sir.

Senator GURNEY. And you are the author of 13 scientific papers?

Dr. KOLODNY. Yes, sir.

Senator GURNEY. Will you proceed with your statement?

Dr. KOLODNY. Yes.

Mr. Chairman, it is indeed an honor to testify as a scientific witness before this committee in an area of current controversy. I have been asked to describe recent research that my colleagues and I have done on the physical effects of cannabis use. I want to stress that Dr. Gelson Toro, a biochemist and director of our laboratories, and Dr. William H. Masters, the director of the Reproductive Biology Research Foundation, have been instrumental in the planning, performance, and analysis of these studies. My testimony today reflects the views of these eminent scientists, in addition to my own thinking. I would also like to acknowledge the invaluable assistance of Mr. Robert M. Kolodner, a fourth-year medical student from Yale University, who participated in the first phase of our investigations.

Research in medicine proceeds along certain basic lines of endeavor when any drug is being considered. A thorough understanding of drug effects is initially obtained through animal experimentation, with particular attention to identifying and devising means to minimize toxic effects of the compound being tested. The world has learned, through unfortunate experience, the price of inadequate studies in this phase, specifically with regard to drug effects in pregnancy. Animal safety is not a panacea for human usage, however, since the consequences of use of any drug by the human may be considerably different from the animal model.

Continuing to speak in broad terms, human drug studies are methodologically limited in many ways. Ethical considerations must be given the highest possible priority by the scientist; therefore, experimental plans that might be ideal from a scientific viewpoint—that is to say, plans that may allow the fullest answer of the particular question being examined—must often be discarded in favor of a less precise method. Time limitations are also relevant to this discussion, because the question of safety of drug use—and I emphasize that I am speaking of any drug, including aspirin—cannot accurately and fully be assessed for many decades, particularly when we consider the reproductive consequences a drug may have. In addition to the above, we must realize that a multiplicity of factors may influence the very areas we wish to evaluate—thus, studies of aspirin's effects on weight gain would be influenced by intercurrent illness, other drugs employed—both for their intrinsic effects and for how they might interact with aspirin—diet, social pressures, and physical activity, to name just a few.

For a valid scientific conclusion about drug effects, we must question the design of an evaluating study, particularly in light of how well controlled the study was; that is to say, how carefully have the investigators worked to insure that what they are observing are actual effects of the drug in question, and not effects attributable to random variation or constant bias from a known or unknown source.

Research in cannabis effects on humans has not always been performed or presented with objectivity. Many studies have been severely limited by indiscriminately including multiple drug users, thus frequently raising more questions than providing useful information. As an example of such research, I would like to comment briefly on the study entitled "Cerebral Atrophy in Young Cannabis Smokers," that was introduced in testimony before this committee on September 18, 1972. In the 10 cases reported, all 10 men had used LSD—many of them over 20 times as—well as cannabis, and 8 of the 10 had used amphetamines. One subject had a previous history of convulsions, four had significant head injuries, and a number had used sedatives, barbiturates, heroin, or morphine. On the basis of these facts, speculative connection between cannabis use and brain damage is highly suspect. Unfortunately, this type of report is typical of much of the research done in this field.

Before discussing specifically the effect of cannabis use on humans, I would like to state that my colleagues and I feel that, in areas of major significance, the physical effects of cannabis use are not well documented by animal studies. To the best of our knowledge, there

are no reports on the effects of cannabis on spermatogenesis in primates or even in mammals——

Mr. Martin. Spermatogenesis is the process of producing sperm?

Dr. Kolodny. This is correct. There are no reports in the literature describing changes, if any, in reproductive hormones in animals given cannabis chronically or acutely; and the hormonal studies reported to date represent, at best, incomplete and, at worst, irresponsible scientific methodology. In as important areas as impairment of fertility or possible teratogenicity—production of physical defects in the developing embryo—animal experimentation has proceeded slowly and left important questions unanswered.

A brief examination of the background literature may be informative. In 1965, Miras reported that female rats maintained on a diet containing 0.2 percent marihuana extract for several months showed a significant reduction in fertility and a reduced growth rate. Teratogenicity was not observed. Persaud and Ellington, used cannabis resin at a dosage of 16 milligrams per kilogram of body weight injected into pregnant rats on days 1–6 of gestation, caused complete fetal resorption; in a subsequent report, dosage levels of 4.2 milligrams per kilogram of body weight on days 1–6 of gestation were shown to have a variety of teratogenic effects. These effects included syndactyly—webbing between the digits—in 72 percent of the animals, encephalocele—hernia of the brain—in 57 percent, phocomelia—abnormal development of the limbs, with the "seal-flipper" appearance also encountered with thalidomide—in 15 percent, complete absence of a limb or limbs in 2 percent, and protrusion of the bowels from the abdomen in 30 percent. Similar work was then repeated by Greber and Schramm in 1969, with litters from female hamsters receiving marihuana described with the following abnormalities: "fetuses with head, spinal, and whole body edema, phocomelia, omphalocele, spina bifida, exancephaly, multiple malformations, and myelocele."

Pace, Davis, and Borgen reported impaired fertility but not absolute sterility in female rats given either delta–9 or delta–8 tetrahydrocannabinol by injection—20 or 40 milligrams per kilogram of body weight—on alternate days for a 30-day period. Harbison and Mantilla-Plata showed that delta–9 tetrahydrocannabinol was transferred across the placenta and was embryo or fetocidal in mice, but no observation of fertility was possible since drug administration began after conception.

It must be stressed that these animal studies cannot be accurately transferred to humans because of obvious differences in the high doses employed and the mode of administration utilized. However, it is apparent that there is a potential risk in cannabis use during pregnancy, and that, at present, there are no adequate studies of women who have used cannabis during pregnancy with relation to the health of their children.

Reproductive studies of cannabis effects in male animals have been far fewer in number. Merari, Barak, and Playes reported that delta-1(2) tetrahydrocannabinol caused deterioration in sexual performance in rats, which they attributed to "reduced sexual motivation." No histologic or endocrine studies were done, however. Ling and his

coworkers administered delta–1 tetrahydrocannabinol to adult male rats for 4 days, but did not report any alteration in gonadal activity. However, they did not measure hormone production or sperm counts and did not examine histologic section of the testes. It is indeed disquieting that there are no careful, controlled studies of chronic or acute cannabis effects on male reproductive physiology in animal species.

Galen, approximately 18 centuries ago, has been cited as stating that "Hempe * * * by much use thereof * * * dryeth up the natural seede of procreation" and "doth refraineth Venereous desires." Much speculation currently exists concerning cannabis and sexuality, but systematic controlled studies of this area have been conspicuously lacking.

We have recently published a report in the New England Journal of Medicine entitled "Depression of Plasma Testosterone Levels After Chronic Intensive Marihuana Use" that we hope will be viewed as an invitation to scientists across the world to direct their attention specifically to possible reproductive consequences of marihuana use.

This report describes our studies in a group of 20 men aged 18 to 28 who had each used marihuana at least 4 days a week for a minimum of 6 months, without use of other drugs during that interval. In the 6 months before the study began, these subjects averaged weekly consumption of 9.4 joints of marihuana, with some subjects averaging as much as 18 joints per week. The overall duration of marihuana use—although not at this dosage level—averaged approximately 3½ years for the group. One subject had used the drug regularly for 8 years. The duration of marihuana use at least 4 days a week in this group averaged 11.1 months.

Men were chosen for this study, after meeting the first criterion of use of marihuana at least 4 days a week for a minimum period of 6 months, according to the following criteria: no history of use of any drug by injection except under a physician's care; no history of ingestion of LSD or other hallucinogens, amphetamines, barbiturates, cocaine, narcotics, hypnotics, or sedatives in the preceding 6 months; no history of using male or female sex hormones; no history of endocrine disease; no history of hepatitis or other liver disease; and alcohol intake not more than two ounces per day.

Twenty healthy men who had never used marihuana and who met the other criteria described above served as a control group. These men were matched with the test group for age and for cigarette-smoking habits. The ages of these men were also 18 to 28 years.

At this point in my discussion, I would like to emphasize the fact that we did not provide marihuana for the men we studied, nor did we ask them to continue their drug use pattern. It also should be stated that we did not supervise their use of marihuana, and specifically that they did not engage in marihuana use in our laboratories or offices.

We investigated blood levels of a variety of hormones that are important in reproduction. The principal male sex hormone, testosterone, was found to be approximately 44 percent lower in the group of men using marihuana chronically and frequently than in the group of men who had never used this drug. This finding was not uniform in all the men studied, however, and it appeared to be related to the amount of marihuana used. Men who averaged 10 or more marihuana "joints"

per week had significantly lower testosterone levels than men who used fewer than 10 marihuana cigarettes weekly.

Interestingly, a standard test which measures the capacity of the testes to produce the male sex hormone showed that in all four subjects tested while they continued marihuana use, normal responses were found—blood levels of testosterone rose from 121 to 269 percent. This would seem to indicate that the effect of marihuana is not directly on the male sex organs, but is at a higher regulatory center, which might be either the pituitary gland or the hypothalamus, a part of the brain quite important in hormone regulation.

Three subjects discontinued the use of marihuana for a 2-week period, and in each instance, a significant increase was seen in blood testosterone during this time. It would therefore appear that the testosterone-lowering effect of marihuana may have been only temporary.

Six of 17 men tested showed sperm counts that were below normal, with some of these men in the area that is considered sterile. Of course, we do not know if the lowered or sterile counts were present before these men began using marihuana. We also do not know if these counts might increase if marihuana use is stopped. This is because it would require a minimum of 3 to 6 months off the drug to evaluate this, since it takes approximately 8 or 9 weeks for a generation of new sperm cells to come to maturity, and at any time there are many generations of sperm cells within the testes.

Two of the 20 subjects using marihuana reported impaired sexual functioning. In one instance, a man who had experienced potency problems intermittently over the preceding year was asked to stop using marihuana, and now, 10 months later, has not had further sexual difficulties. We have also seen two patients, who were not part of this research study, where frequent long-term use of marihuana was associated with impotence and lowered plasma testosterone. In both these instances as well, discontinuing the marihuana use led to normal sexual functioning.

We would like to point out that this study has a number of problems that need to be considered for a careful interpretation of our findings. First, the sample size is quite small, so that it is not possible to accurately generalize our findings to all young men using cannabis this frequently. We do hope that others will enlarge these and related studies in controlled investigations. Second, we have no absolute verification that the marihuana users were not also using other drugs that might lower hormone levels or affect sperm production. Third, we have no knowledge of the purity or potency of the marihuana used by these men. Therefore, we reiterate our position that this work raises an area of serious concern, but does not answer specifically the question of safety in marihuana use.

There are theoretical possibilities that might be related to our findings beyond those that I have discussed. Since at least some of the active constituents of marihuana have been shown to cross the placenta, there may be a significant risk of depressed testosterone levels within the developing fetus when this drug is used by a pregnant woman. Since normal sexual differentiation of the male depends on adequate testosterone stimulation during critical stages of develop-

ment, occurring approximately at the third and fourth months of pregnancy, it is possible that such development might be disrupted. Theoretically, there is also the possibility that marihuana use by the prepubertal male may delay the onset or completion of puberty or may interfere with bone growth, if a suppression of pituitary or hypothalamic function occurs. Neither of these possibilities has been investigated.

Drs. Masters, Toro, and I have been involved in further research into marihuana effects on male hormone status, where we have measured the effects of acute marihuana use on the hormone levels of experienced smokers. In this experimental setting, we are working with highly controlled conditions, and because these subjects are hospitalized, we can be sure they are not using any additional drugs, including tobacco and alcohol.

In the initial phase of these studies, which is all I am able to report about today, four men have been evaluated during the first 3 hours after smoking a single marihuana cigarette of known potency. This testing is done after they have abstained from any marihuana use for at least 2 weeks, and it is done in a standardized format so that variations in activity or time of day do not occur. Two days prior to the test day, each subject undergoes a series of blood samples to coincide with the samples to be obtained during the test: In this way we can evaluate possible stress effects of obtaining the blood sample as well as variation related to time.

In each instance, plasma testosterone levels dropped significantly lower than the level immediately prior to smoking marihuana, with the decreases attributable to marihuana ranging from 10 to 36 percent, with an average decrease of 27 percent. We plan to expand these studies, and a full report will be prepared within a year.

In addition, the Reproductive Biology Research Foundation has submitted to the N.I.H. a proposal to study the effects of chronic, intensive marihuana use by women in the reproductive age range specifically designed to evaluate their hormonal status and sexual functioning. If approval and funding for this proposal are obtained, such studies could begin in the near future.

To summarize our opinion on the issue of legalization of marihuana, we must state that from a scientific viewpoint, there are too many unanswered questions to warrant such a change in current laws. The resolution of these questions may present convincing evidence of either the safety or danger of marihuana use, but until such definitive information is available, we consider it of paramount import to encourage careful and objective research in this field.

However, we wish to draw the distinction between our role as scientists and as concerned citizens. Scientists do not and should not make or enforce laws, and our position is simply that of wanting the legislators and the public to be well-informed on all sides of this issue.

Believing that the question of legalization of marihuana is premature, we would now like to state our personal hope for a move toward the decriminalization of marihuana possession. When marihuana possession is a felony, society as well as the individual pays a high price indeed, measured not only in dollars and time, but in

immeasurable disruption of lives. The attention of law enforcement agencies has been necessarily diverted from other areas of concern, and yet there has not been a decrease, but a marked increase, in the use of this drug.

Thank you, Mr. Chairman.

Senator GURNEY. Thank you, Doctor.

Mr. Martin.

Mr. MARTIN. Thank you, Mr. Chairman.

Dr. Kolodny, as you know, there is a widespread belief, especially among young people, that marihuana enhances one's sexual life. Is this borne out by your own research or by the research of any other scientists with whom you are familiar?

Dr. KOLODNY. There has been no research evidence that indicates that marihuana acts as a sexual stimulant. In point of fact, although our studies were not directed at answering this question, the finding of lowered testosterone levels and impotence in at least some men using marihuana points to the fact that an opposite effect from that so popularly stated may, in fact, be going on at least in some users of the drug.

Mr. MARTIN. Could it be that as a result of the general euphoria which results from marihuana use, young people who use it are under the impression that their sexual powers have been enhanced, when this is not in fact the case?

Dr. KOLODNY. This is one possibility, certainly. Another might be that the perception of feelings might be altered but the actual performance not changed or possibly even diminished somewhat but that the perception of the experience was altered in some way.

Mr. MARTIN. Is there enough evidence to make possible a comparison of the effects of alcohol and tobacco in the reproductive system as opposed to the effects of marihuana which you have described?

Dr. KOLODNY. Yes, sir, I think there is and I base my comments on work that I have conducted as well as work done by others. Alcohol, when used with high frequency in terms that would generally be considered alcohol abuse, certainly can produce disruption of normal hormone balance and lowering of testosterone and can produce actual wasting of the testicular tissue as well as other feminizing changes in the male such as enlargement of the breasts.

The effects of excessive alcohol use on the production of sperm are less clearly understood, but apparently alcoholism can result in decreased sperm production. However, our studies of the acute use of alcohol, that is, the effect of the immediate effects of graded amounts of alcohol on blood levels of testosterone, indicate no drop at different times of day and under different conditions in experiments that were very carefully controlled. Our evidence having to do with marihuana, although I label this as preliminary evidence, shows that marihuana does have a sudden effect of lowering testosterone values within a matter of hours.

The effects of cigarette smoking on reproduction have been greatly exaggerated, I believe, in the popular press. There is currently no good evidence of which I am aware, based on my own work or work of others, that cigarette smoking decreases hormone production or decreases sperm production.

Mr. MARTIN. Your study mentioned several cases of impotence resulting from heavy marihuana use. Do you know of any other medical reports that would tend to confirm this finding?

Dr. KOLODNY. There have been anecdotal reports, as this report is also, mentioning the occurrence of impotence associated with heavy cannabis use in both Jamaica and in portions of the Mideast. However, these studies have not been done carefully enough to delineate what the actual mechanisms are. Animal studies have shown that at least in the rat a deterioration in male sexual performance has been described but the animal literature is very, very sparse on this point.

Mr. MARTIN. In the research paper on which your testimony today is based, you mention the possibility that there may be some relationship between the effects of marihuana on the reproductive system and the passive behavior—sometimes referred to as "the amotivational syndrome"—which many observers have noted in regular marihuana users. Could you elaborate on this briefly?

Dr. KOLODNY. Yes, sir. In elaborating on this I would like to label what I am saying as very highly speculative but nevertheless it does have a theoretical basis. There is in existing literature a correlation between levels of testosterone and aggression, and I use that term in the scientific sense, not in a sense of socially deviant behavior. When testosterone levels get low, usually ambition and aggression get low. This has been documented in animals, in primates and in the human in a variety of different studies over the past 5 years.

In theory, if the reports of alteration of behavior patterns in heavy cannabis users are accurate, the basis for this so-called amotivational syndrome may potentially be the decreased testosterone level.

Mr. MARTIN. A very interesting speculation, Dr. Kolodny. I hope it is pursued scientifically.

If cannabis products impair the DNA of sperm cells, as some researchers now report, could this imply the possibility that the sperm of marihuana smokers thus affected might produce genetically damaged offspring?

Dr. KOLODNY. Mr. Martin, that is a very difficult question to answer, and I think I would have to say that it cannot be answered on the basis of any research that has been done. That possibility, I believe, would exist but I would like to qualify what I am saying by the statement that much of the testimony today, I think, has been couched in terms of scientific opinion rather than actual scientific fact, and I would like to distinguish my answer there as my opinion, that is, that such genetic damage might occur, but it would require careful studies in the human to know whether that is happening.

Mr. MARTIN. In your statement, Dr. Kolodny, you said that your findings are preliminary, and that there will have to be more research before these findings can be firmly established. I have a philosophical question. Should a scientist publish findings which he considers to be preliminary?

Dr. KOLODNY. Mr. Martin, I would answer this question in this way. I think it is a good question. I believe that it is the responsibility of a scientist to call the attention of other scientists to possible areas of research for their consideration. It is also my personal belief, and I will so state it, that there is no piece of scientific research that

can be fully accepted until it has been repeated by at least one independent party, that is, who has not participated in the original work. This process of the replication of scientific experiments, I think, is a fairly accepted one in the academic community, and I use the word preliminary in that sense, that while I have full confidence in the findings in the small group of men we studied I will have more confidence when other researchers have enlarged these studies.

Mr. Martin. You stated in your prepared statement that you would be opposed to the legalization of marihuana?

Dr. Kolodny. That is correct.

Mr. Martin. That is, complete legalization? Could you briefly state the basic reasons for your opposition to legalization?

Dr. Kolodny. Yes, sir, I will try to summarize those reasons. I am restricting my remarks to my own field of expertise, which is the field of reproduction, but I do acknowledge the testimony of other scientists in different areas that I think speaks toward the same point, and that is as Dr. Morishima pointed out, there are many research areas that have simply not been fully enough studied for us to even begin to make a statement of safety in marihuana use.

In my particular area there is evidence currently, based on both animal and human experimentation, that indicates the possibility of consequences that potentially are serious ones, and in light of these possibilities, which I would mention briefly as disruption of sperm production, the possibility of birth defects, the possibility of impairment of hormone balance and the possibility of either inhibition of puberty or disruption of normal sexual differentiation during fetal development, I think until answers to these questions are more fully known that it would be extremely poor judgment to consider legalization.

Mr. Martin. A further question on marihuana and the law. You said that you favor rewriting the marihuana law so that simple possession would be decriminalized. I think this is something upon which just about everyone agrees and very few young people, if any—I suppose there are some—are being sent to jail today for simple possession. But there are some who argue that a penalty, even if a minimal penalty, should be retained in order to make it clear to young people that society has to protect itself against this, and society does not approve of its use. Other people feel that any kind of punishment is counterproductive. What is your own thinking on this matter?

Dr. Kolodny. I think that is a good question and I do sincerely hope that no one is being jailed today for simple possession. The use of sanctions of the law in the form of perhaps a fine or some other appropriate punishment, if one chooses to use that word, is certainly a necessary thing if one is not going to legalize the drug, and I am in favor of retaining legal sanctions but decriminalizing from the viewpoint of an actual jail sentence, and I do specify for possession of the drug.

Mr. Martin. All right, thank you for clarifying your position on this matter.

Did I understand correctly that your studies that have recently been conducted have been funded by NIH?

Dr. Kolodny. No, sir.

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Mr. MARTIN. Or you have applied for funding?

Dr. KOLODNY. We have applied for funding for doing a similar study in females to look for reproductive consequences of cannabis use. We are currently carrying on research that also has been funded by a private source. The Frederick Ayer Foundation has provided our funding.

Mr. MARTIN. I have no further questions, Mr. Chairman.

Senator GURNEY. Mr. Sourwine.

Mr. SOURWINE. No, thank you, sir.

Senator GURNEY. Thank you very much, Doctor. I appreciate your testimony here on a very important subject.

Professor Leuchtenberger, I am sorry you have to wait so long. You have been very patient and we certainly welcome your testimony, Professor. Could you identify yourself for the record?

TESTIMONY OF PROF. CECILE LEUCHTENBERGER, HEAD OF THE DEPARTMENT OF CYTOCHEMISTRY AT THE SWISS INSTITUTE FOR EXPERIMENTAL CANCER RESEARCH, LAUSANNE, SWITZERLAND

Dr. LEUCHTENBERGER. I am Prof. Cecile Leuchtenberger, and I am the head of the Department of Cytochemistry at the Swiss Institute for Experimental Cancer Research, Lausanne, Switzerland.

Senator GURNEY. I will ask a few questions here to establish your qualifications.

I understand you are a biologist who has had special training in experimental cancer research, cytology, cytochemistry and biophysics, is that correct?

Dr. LEUCHTENBERGER. Yes.

Senator GURNEY. And that you received your Doctor of Philosophy in Biology at Columbia University in 1949?

Dr. LEUCHTENBERGER. Yes.

Senator GURNEY. And that you continued your advanced education at institutes in Sweden and in Switzerland?

Dr. LEUCHTENBERGER. Yes.

Senator GURNEY. And from 1950 to 1959 you were head of the Department of Cytochemistry at the Institute of Pathology, Western Reserve University, in Cleveland?

Dr. LEUCHTENBERGER. Yes.

Senator GURNEY. As a matter of fact, you established this department, did you not?

Dr. LEUCHTENBERGER. Yes, I did.

Senator GURNEY. And you subsequently worked at the Children's Cancer Research Foundation and the Children's Medical Center at Harvard University?

Dr. LEUCHTENBERGER. Yes.

Senator GURNEY. From 1956 to 1962, you served as a member of the advisory committee of the American Cancer Society, and you also served on its committee on research on lung cancer?

Dr. LEUCHTENBERGER. Yes.

Senator GURNEY. And your research has at different times been

supported by the U.S. Public Health Service and the World Health Organization, in addition to various foundations?

Dr. LEUCHTENBERGER. Yes.

Senator GURNEY. And you are now an associate professor at the medical school of the University of Lausanne in Switzerland?

Dr. LEUCHTENBERGER. Yes.

Senator GURNEY. And you have also lectured extensively at European and American universities?

Dr. LEUCHTENBERGER. Yes.

Senator GURNEY. And you are the author of over 130 scientific papers?

Dr. LEUCHTENBERGER. Yes.

Senator GURNEY. All told, you have had more than 30 years experience in cancer research, and 26 years of experience in cell research?

Dr. LEUCHTENBERGER. Yes.

Senator GURNEY. I understand you reside in Switzerland but you are an American citizen since 1944, is that correct?

Dr. LEUCHTENBERGER. Yes.

Senator GURNEY. We will be glad to have your statement, Doctor.

Dr. LEUCHTENBERGER. Mr. Chairman, let me thank you first for the honor to be invited to report about our research studies on marihuana before this distinguished committee. We started our experimental studies on marihuana in 1970 and I would like to say this work was done in collaboration with Prof. Dr. Rudolf Leuchtenberger M.D., experimental pathologist. The marihuana was obtained after permission of the Health Department of the Swiss Government, from Dr. Olav J. Braenden, director, United Nations Narcotics Laboratory, Geneva, Switzerland and the work was supported by the World Health Organization.

Our experimental work on marihuana has been concerned so far with three principal questions.

(1) What effect has smoke from marihuana cigarettes on the respiratory system, and how does the effect compare with that of smoke from tobacco cigarettes?

(2) What effect has smoke from marihuana cigarettes on the cell metabolism, in particular, what is its effect on the genetic material, that is on the DNA?

(3) What effect has smoke from marihuana cigarettes on the spermatogenesis?

Experimental exploration in this direction appeared to us necessary because in spite of the fact that smoking of marihuana has become a widespread human habit, there was hardly any information concerning effects of marihuana cigarette smoke itself on the respiratory system and other tissues and their cell metabolism.

Furthermore, during our extensive experimental studies concerning the role of tobacco cigarette smoke in lung carcinogenesis and its effect on cellular DNA metabolism of the respiratory system, we had developed model systems permitting to examine effects of fresh smoke on tissues, cells and DNA under standardized conditions.

There is no intention on my part here to impose on you any technical details but I think for a better understanding of the results which

we will discuss here today, I would like to say, if I may, just a few words about the model systems which we used.

There are two main model systems which we used, and which are actually complementary to each other.

In the first model system we expose cultures prepared from animal or human lung to puffs of fresh smoke from marihuana cigarettes. Now, this model system is particularly suitable to assess time sequential alterations in cells and tissues, after short- and long-term exposure.

In the second model system we use inhalation experiments in mice with marihuana cigarette smoke. I would like to say that inhalation experiments in mice pose a difficult problem because man is the only individual who inhales voluntarily the smoke either from tobacco or marihuana cigarettes. However, we have developed a machine which permits individual mice to inhale repeatedly one puff of smoke alternating with fresh air thus imitating as closely as possible the habit of human cigarette smokers. This model system permits us to assess alterations in the respiratory and other systems after short- or long-term inhalation of marihuana cigarette smoke in living animals.

For a better understanding of the results to be discussed, a few words should be said at least in regard to the methods employed in analysis of the genetic material DNA. We used special quantitative cytochemical technics, such as radioautography, microspectrography, and microfluorometry. The unique character of these methods lies not only in the possibility that an analysis of DNA can be made in a single cell, or in part of a cell, such as the nucleus or the chromosomes, but also that the DNA analysis can be made in situ in microscopic preparations, in other words, without destroying cell or tissue architecture. Thus, it is possible to make a direct comparison between morphology and DNA behavior on the same cell and from cell to cell at the microscopic level.

There are three different types of experimental studies which we have carried out so far, and on which the following results were obtained.

STUDY 1 : A COMPARISON BETWEEN EFFECTS ON MOUSE LUNG CULTURES OF SHORT-TERM EXPOSURE TO SMALL DOSES OF SMOKE FROM CIGARETTES MADE OF TOBACCO AND OF SMOKE FROM CIGARETTES MADE OF THE SAME TOBACCO BUT TO WHICH MARIHUANA WAS ADDED

In the first experimental study we exposed mouse lung cultures to puffs of fresh smoke from tobacco cigarettes without marihuana, and then the same cultures to puffs of fresh smoke from tobacco cigarettes to which marihuana was added. In these experiments we used a relatively low dose or, as we say in technical terms, a small puff volume of the cigarette smoke and a relatively short exposure.

It was found that addition of marihuana to tobacco cigarettes produced a smoke which was much more harmful to these mouse lung cultures than was the smoke from tobacco cigarettes without marihuana. From the data given in figures 1 and 2, it can be seen that daily exposure to two puffs (puff volume 8 ml) for 5 consecutive days to

cigarette smoke without marihuana did not produce significant alterations in the cultures, when compared with nonexposed control cultures. On the other hand, the same type of exposure to cigarette smoke with marihuana evoked significant alterations in cell morphology, cell division, DNA content and DNA synthesis.

The frequencies of all these alterations were statistically significant when compared not only with frequencies in nonexposed control cultures, but also when compared with frequencies in cultures exposed to tobacco cigarettes without marihuana.

The finding that after exposure to smoke from tobacco cigarettes with marihuana there were many abnormalities in cell division and a shift from the constant normal DNA content in cells towards higher DNA amounts or polyploidy (fig. 2), deserves special attention, because both types of alterations are often observed in precancerous or cancerous lesions.[1]

Fig. 1

EFFECTS OF FRESH SMOKE (2 PUFFS DAILY FOR 5 DAYS) FROM CIGARETTES WITHOUT AND WITH MARIJUANA (0,4% TETRAHYDROCANNABINOL) ON MORPHOLOGY, MITOTIC INDEX AND DNA SYNTHESIS IN EPITHELOID CELLS OF LUNG EXPLANTS FROM SNELL'S AND C 57 BLACK MICE.

TYPE OF EXPERIMENT	ABNORMALITIES OF CELLS	MITOTIC INDEX (n_1 = 54)	DNA CONTENT (F.M.)* (n_2 = 450) FREQUENCY OF NUCLEI 2 DNA / 4 DNA	DNA SYNTHESIS (^{3}H TdR) (n_1 = 15) FREQUENCY OF LABELED CELLS
CONTROL	0	0,28 ± 0,07	10/1	10,9 ± 2,1
CIGARETTE SMOKE WITHOUT MARIJUANA	(+) − +	0,39 ± 0,002	8/1	13,6 ± 2,6
CIGARETTE SMOKE WITH MARIJUANA	++	0,6 ± 0,11 pCo = .0005 pCi = .025	2/1 p = .0005	19,2 ± 1,9 pCo = .01 pCi = .05

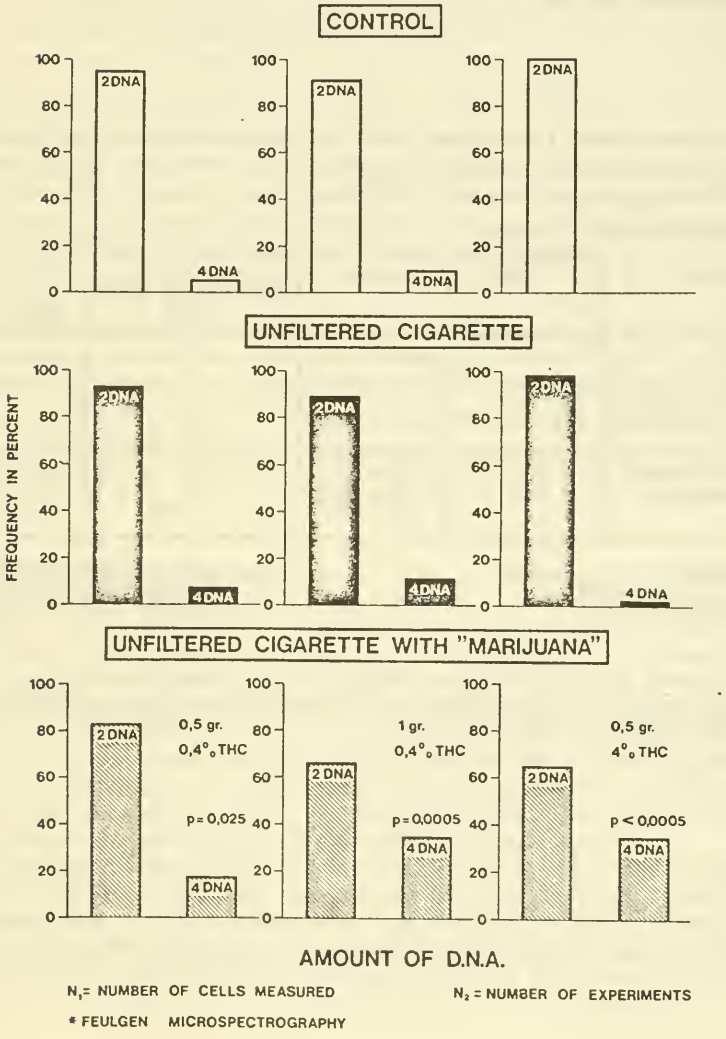
(+) = DOUBTFUL
(+) − + = SLIGHT EFFECT
++ = PRONOUNCED EFFECT

F. M.* = FEULGEN MICROSPECTROGRAPHY
n_1 = NUMBER OF CULTURES EXAMINED
n_2 = NUMBER OF CELLS MEASURED

[1] The results mentioned here were published in more details under the title "Morphological and cytochemical effects of marihuana cigarette smoke on epithelioid cells of lung explants from mice" (Leuchtenberger C. and Leuchtenberger R.) in "Nature," vol. 234, No. 5326, pp. 227–229, 1971.

Fig.2

COMPARISON BETWEEN EFFECTS OF FRESH SMOKE (2 PUFFS DAILY, 5 DAYS) FROM ONE UNFILTERED CIGARETTE WITHOUT AND WITH DIFFERENT DOSES OF "MARIJUANA" AND THC, ON THE DNA CONTENT* OF EPITHELOÏD CELLS (N_1 = 1200) FROM LUNG EXPLANTS OF SNELL'S MICE. (N_2 = 3)



N_1 = NUMBER OF CELLS MEASURED

N_2 = NUMBER OF EXPERIMENTS

* FEULGEN MICROSPECTROGRAPHY

STUDY 2 : A COMPARISON BETWEEN EFFECTS ON HUMAN LUNG CULTURES OF SHORT-TERM EXPOSURE TO LARGER DOSES OF SMOKE FROM CIGARETTES MADE OF KENTUCKY STANDARD TOBACCO AND OF SMOKE FROM CIGARETTES MADE OF MARIHUANA ONLY

If we come now to the second type of the experimental study, here we used human lung cultures, because after all it is the human problem in which we are interested. We used human lung cultures from adult and fetal lungs, and compared effects of smoke from cigarettes which were made from tobacco only—whereby we used the so-called Kentucky standard tobacco—with effects of smoke from cigarettes which were prepared with the same paper but made from marihuana only.

For this study on human lung cultures larger puff volumes, 25 milliliters of smoke were utilized than in the study on mouse lung cultures, 8 milliliters. This puff volume was chosen because it resembles more closely the standard puff volume of 35 milliliters inhaled by human smokers.

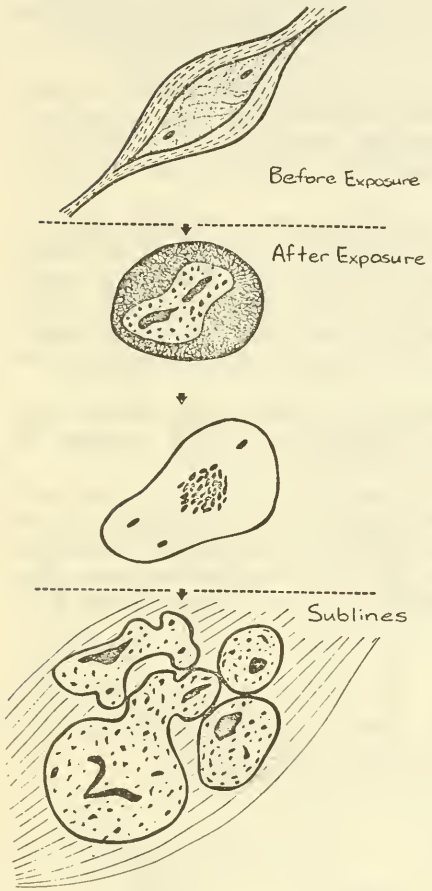
It was found that the alterations in human lung cultures—adult or fetal lung—were very similar after exposure to smoke from marihuana cigarettes and after exposure to smoke from Kentucky standard cigarettes. From the scheme in figure 3 and the data given in figures 4 and 5, it can be seen that each type of smoke produced abnormalities in DNA synthesis, in cell division, and stimulated irregular growth of the lung cultures.

Furthermore, after exposure to each type of smoke the human lung cultures disclosed a variability in number and DNA content of chromosomes.

However, this disturbance of the genetic equilibrium of the cell population which persisted for prolonged periods after exposure was more marked after exposure to smoke from marihuana cigarettes than after exposure to smoke from Kentucky standard tobacco cigarettes—compare statistical significance, p values in figures 4 and 5.

Fig. 3

Sequential morphological and cyto-chemical changes in cells from adult human lung explants and fetal lung cultures after exposure to fresh smoke from Marihuana cigarettes.



Stage I

Inhibition of DNA synthesis and of mitosis.

Stage II

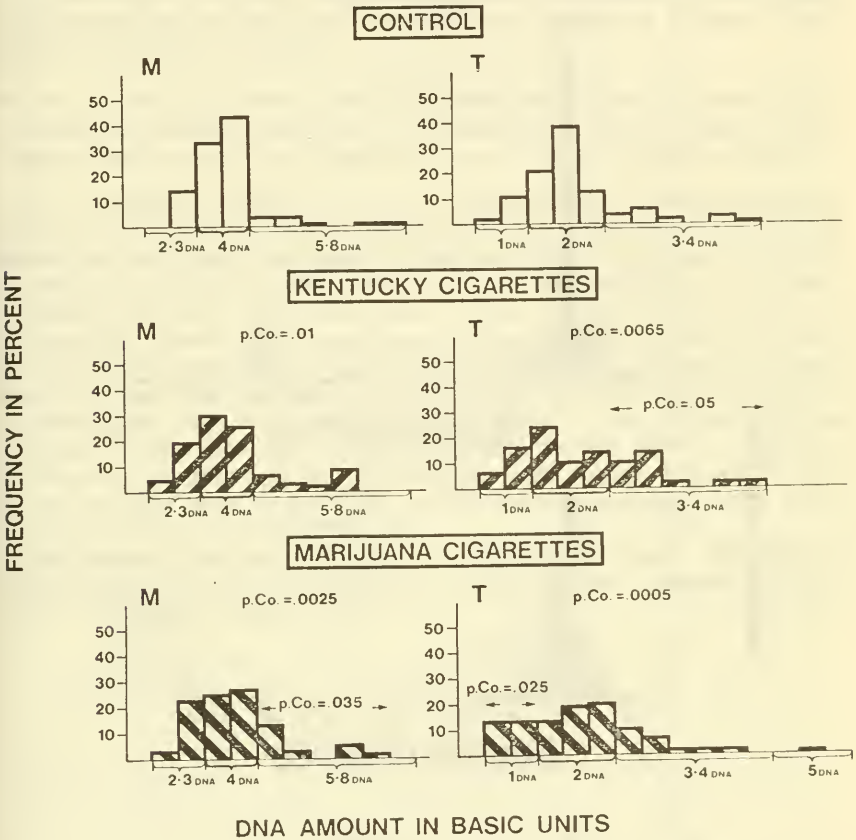
Enlargement and irregularities of nuclei, high DNA content, stimulation of DNA synthesis, abnormal mitosis, lagging of chromosomes.

↓

Hyperplasia, abnormal proliferation, high DNA content, abnormal mitosis, abnormal number and DNA content of chromosomes.

Fig.4

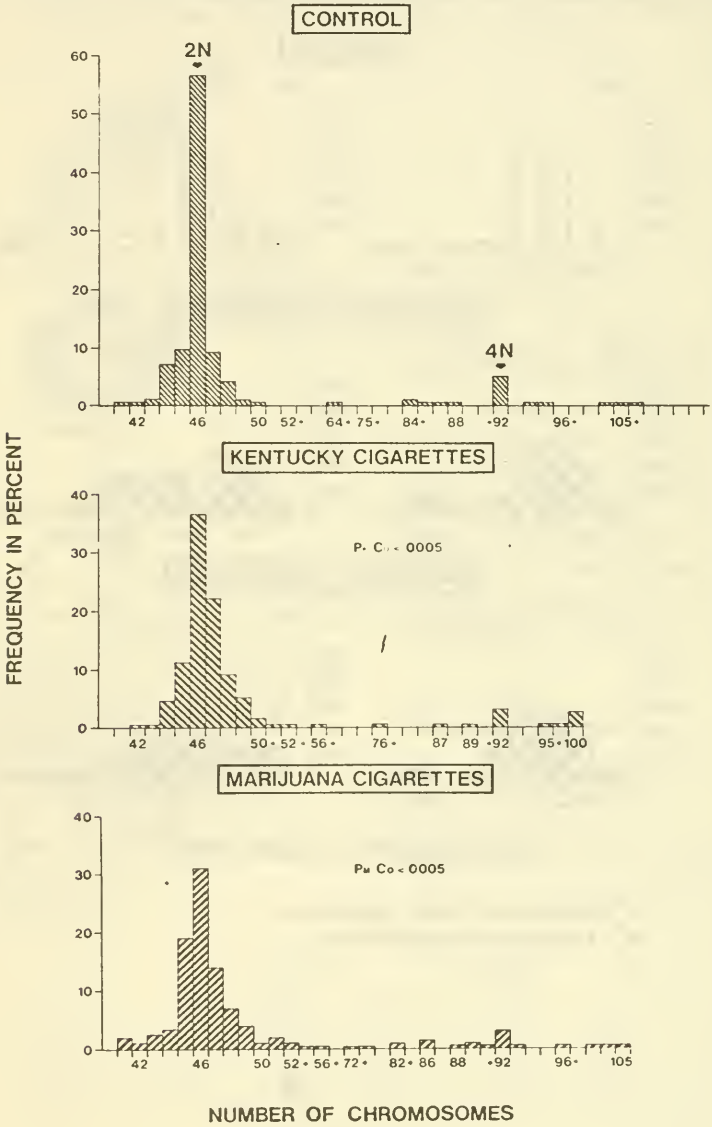
COMPARISON BETWEEN THE DNA CONTENT (FEULGEN MICROFLUOROMETRY) IN METAPHASE (M) AND TELOPHASES (T) OF FIBROBLASTIC CELLS (N^{*} = 431) FROM A CONTROL ADULT HUMAN LUNG EXPLANT AND AFTER EXPOSURE TO FRESH SMOKE FROM MARIJUANA AND KENTUCKY CIGARETTES. (N^{1} = 5)



N^{*} = Number of cells measured
N^{1} = Number of experiments

Fig.5

COMPARISON BETWEEN NUMBER OF CHROMOSOMES OF FIBROBLASTIC CELLS (N*=633) FROM A CONTROL ADULT HUMAN LUNG EXPLANT AND AFTER EXPOSURE TO FRESH SMOKE FROM KENTUCKY AND MARIJUANA CIGARETTES. (N¹=12)



N* = NUMBER OF METAPHASES COUNTED
N¹ = NUMBER OF CULTURES EXAMINED

This larger effect of marihuana cigarette smoke on chromosomes and their genetic material gains special significance if the following observation is taken into consideration. Cigarettes made of marihuana smoked and drew less well than cigarettes made of Kentucky tobacco. The marihuana cigarettes, which contain a sticky resin, have a much larger side stream—this means much more smoke is lost in the air than with ordinary tobacco—so that much less marihuana smoke reached the cultures than after tobacco smoke.

It remains to be seen whether long-term exposure to marihuana and tobacco smoke produces even greater differences between their effects on genetic material.

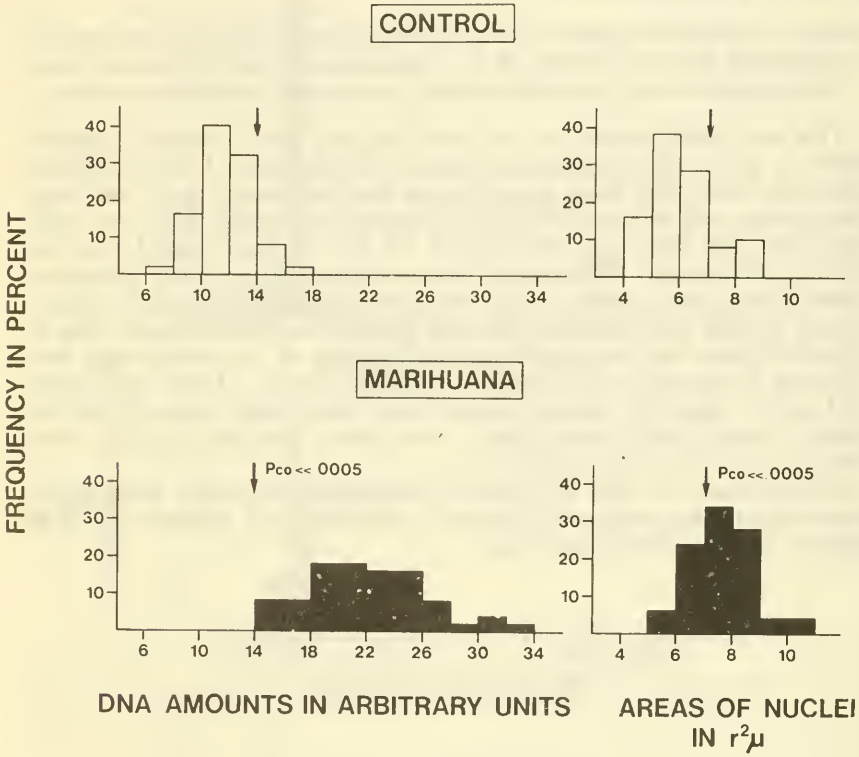
STUDY 3 : EFFECTS OF SHORT- AND LONG-TERM INHALATION OF MARIHUANA CIGARETTE SMOKE—ALONE OR IN COMBINATION WITH TOBACCO CIGARETTE SMOKE—ON THE RESPIRATORY AND OTHER SYSTEMS OF MICE

The last study which we are carrying out, are inhalation experiments in mice with marihuana cigarette smoke. Here I would like to stress the fact that these experiments are underway, they are very incomplete, and the results which I present here today have not been published and they are preliminary. So far we have found that inhalation of smoke from marihuana cigarettes produced irregular growth in the respiratory system of these mice. The interesting observation is, and this was done by Dr. Rudolf Leuchtenberger, who is a pathologist, that he noted that the location of the alterations was different from that after tobacco cigarette smoke. After inhalation of tobacco cigarette smoke, alterations were found mainly in the larger bronchi and bronchioles, while after marihuana they were found in terminal bronchioles.

Furthermore, as seen in figure 6, inhalation of smoke from marihuana cigarettes produces a marked variability and increase in DNA content in these bronchial cells.

Fig.6

AMOUNT OF DNA* AND SIZE OF NUCLEI (N=600) IN BRONCHIOLAR EPITHELIAL CELLS OF SNELL'S CONTROL MICE AND AFTER INHALATION OF FRESH SMOKE FROM MARIHUANA CIGARETTES. (~2000 PUFFS)



* MICROSPECTROPHOTOMETRY

N=NUMBER OF NUCLEI MEASURED

Another observation in this inhalation experiment, which is even more preliminary than this one, concerns the reproductive system of the male mouse. It was found that after male mice had inhaled for 3 months puffs of smoke from approximately 100 cigarettes made of marihuana alone, there was a marked disturbance in spermatogenesis which was not found with the parallel group which had inhaled the tobacco smoke. After marihuana there were not only less mature sperms than in the controls or in the mice which had inhaled tobacco smoke, but many of the spermatids carried a faulty and reduced amount of DNA.

Mr. MARTIN. A spermatid is merely a sperm cell?

Dr. LEUCHTENBERGER. It is a stage just before the mature sperm is formed. I should like to say that such spermatids should contain exactly half the amount, haploid, of what we call the normal diploid amount of DNA. If this preliminary observation can be confirmed on a larger series of experiments, it would indicate that marihuana smoke interferes also with male fertility. In our previous extensive studies concerned with the fertility problem, which had nothing to do with the marihuana problem, we had found that reduced amounts of DNA in spermatids are frequently associated with cattle and human infertility.[2]

In conclusion, I would like to say that we realize fully that many more experimental studies are urgently needed before any definite conclusions can be drawn concerning long- and short-term effects of marihuana cigarette smoke on tissues, cells and their genetic material, DNA.

Nevertheless, on the basis of the data obtained so far in our experimental studies [3] the following statement appears justified.

Marihuana cigarette smoke has a harmful effect on tissues and cells of humans and of animals. The observation that marihuana cigarette smoke stimulates irregular growth in the respiratory system which resembles closely precancerous lesions would indicate that long-term inhalation of marihuana cigarette smoke may either evoke directly lung cancer or may at least contribute to the development of lung cancer. The observation that marihuana cigarette smoke interferes with the DNA stability in cells and in chromosomes, that is, it disturbs the genetic equilibrium of the cell population, strongly suggests that long-term inhalation may alter the hereditary material DNA and may also have mutagenic potentialities. Consequently further extensive research is urgently needed to explore chronic effects of marihuana cigarette smoke on cells and tissues. In particular, studies should be carried out which are concerned with the problem of possible mutagenic properties of marihuana.

Thank you.

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[2] Leuchtenberger C., Weir D. R., Schrader F., and Leuchtenberger R. "Decreased Amounts of Desoxyribose Nucleic Acid (DNA) in Male Germ Cells as a Possible Cause of Human Male Infertility," Acta Genet. 6: 272–278, 1956. The results mentioned here were published in more detail under the following titles: "Abnormalities of Mitosis, DNA Metabolism and Growth in Human Lung Cultures Exposed to Smoke From Marihuana Cigarettes, and Their Similarity With Alterations Evoked by Tobacco Cigarette Smoke" (Leuchtenberger C. and Leuchtenberger R.) in United Nations Bulletin, ST/SOA/SER.S/37 November 17, 1972; "Effects of Marihuana and Tobacco Smoke on Human Lung Physiology" (Leuchtenberger C., Leuchtenberger R., and Schneider A.) in Nature, vol. 241, No. 5385, pp. 137–139, 1973; "Effects of Marihuana and Tobacco Smoke on DNA and Chromosomal Complement in Human Lung Explants" (Leuchtenberger C., Leuchtenberger R., Ritter U., Inui N.) in Nature, vol. 242, No. 5397, pp. 403–404, 1973

[3] See summary of main findings in table 1.

TABLE I

Main findings obtained in our experimental studies concerned with effects of marihuana cigarette smoke on tissues, cells and their DNA metabolism.

(1) *Cultures of animal and human lungs*—after repeated exposure to smoke from marihuana cigarettes disclose abnormalities in DNA synthesis, in number of chromosomes and their DNA content, in cell division and growth (atypical proliferation).

(2) *Mice*—after repeated inhalation of smoke from marihuana cigarettes disclose atypical proliferation in bronchi of lungs accompanied by abnormalities in DNA synthesis and cell division. There are also disturbances in spermatogenesis, such as reduction of DNA content in spermatids.

Senator GURNEY. Thank you, Professor. You mentioned in the last part of your statement that marihuana cigarette smoke may have mutagenic potentialities. What do you mean by that?

Dr. LEUCHTENBERGER. It means that marihuana cigarette smoke may alter the hereditary material. We understand under a mutagen an agent which produces a change in the genetic material which is hereditary.

Mr. MARTIN. That would lead or could lead to abnormal births?

Dr. LEUCHTENBERGER. If you disturb the normal equilibrium of the genetic material the possibilities that you would get abnormal growth must be considered.

Mr. MARTIN. Have you found evidence that marihuana or that cigarettes laced with marihuana—I just want to understand—either one is much more likely to harm lung tissues than only cigarettes?

Dr. LEUCHTENBERGER. Yes.

Mr. MARTIN. Did your experiments produce clearly cancerous formations in either the mice or in the lung tissue which you exposed to marihuana?

Dr. LEUCHTENBERGER. No, we have no cancer so far but you must not forget that we only used relatively short-term inhalation and short-term exposure. For instance, from our experiments which we did with tobacco cigarette smoke, we know that the mice had to be exposed to inhalation for 1 year or longer before we saw enhancement of the lung carcinogenesis. Such long-term experiments with marihuana are urgently needed. I am sorry if I did not express it sufficiently that the results were obtained after relatively short-term exposure.

Mr. MARTIN. But there are certain changes in the cell structures which suggested to you that the lungs were moving, the lung tissue was moving in a precancerous direction?

Dr. LEUCHTENBERGER. Yes, as I pointed out, there is such an indication. After marihuana cigarette smoke there are precancerous stages similar to those after tobacco cigarette smoke, of which we know that they precede malignant transformation, or cancer.

Mr. MARTIN. Do you plan to conduct any experiments on the long-term effects of cannabis on lung tissues?

Dr. LEUCHTENBERGER. We have such experiments underway but I would not like to talk about them because they are too scanty and unfinished.

Mr. MARTIN. What was the THC content of the marihuana you used in your experiments—was it strong marihuana or relatively weak?

Dr. LEUCHTENBERGER. We got from Dr. Braenden marihuana with

0.6 percent, and with 4 percent of THC, and we compared effects on mouse lung cultures and DNA. Although we did not make a dose response experiment, we did find that abnormalities in DNA were larger after larger concentrations of the tetrahydrocannabinol in marihuana. But I would like to say that before making a definitive statement, there should be experiments done where different doses of THC are used and assessed as to their effects on DNA.

Mr. MARTIN. I do not know whether you feel qualified to answer this question. Professor Leuchtenberger, but it has been suggested by some sociologists and educators in the United States that drug education is counterproductive, that it does not scare young people away from drugs while it frequently excites their curiosity. Would you have any comments on this?

Dr. LEUCHTENBERGER. I feel that this statement is not a correct statement. We must not underestimate the intelligence and the openness of young people. I can say from my own experience that the young people would like very much to have the scientific facts instead of emotions. The few young Swiss people with whom I have discussed the problem of marihuana in Switzerland, and actually other young Americans who work over there, when they see the data, that is when they see that marihuana smoke does damage to the cells of the respiratory system, and to the DNA, I think they give smoking of marihuana a second and third thought. I therefore feel very strongly that education of children in schools concerning health-damaging properties of marihuana should start as soon as possible. They should be informed on the scientific facts as they become available.

Mr. MARTIN. Do you think the kind of scientific evidence that has been presented at this hearing today might be effective in persuading some young people who are being—are leaning toward marihuana to consider it?

Dr. LEUCHTENBERGER. I am convinced of that.

Mr. MARTIN. Thank you for that statement, Professor Leuchtenberger.

A final question I would like to ask for you comment on two passages from a book by Dr. Lester Grinspoon of Harvard University, a Harvard psychiatrist, "Marihuana Reconsidered." It is a best selling book, probably the most popular of all the promarihuana books—and there have been quite a few of them. These are two passages that appear on different pages. On one page he says:

> It is quite true that among the hundreds and hundreds of papers dealing with cannabis, there is relatively little methodologically sound research. Yet, out of this vast collection of largely unsystematic recordings emerges a very strong impression that no amount of research is likely to prove that cannabis is as dangerous as alcohol and tobacco.

That was written in 1971.

And on page 371, there appeared the following passage:

> Indeed, the greatest potential for social harm lies in the scarring of so many young people and the reactive, institutional damages that are direct products of present marihuana laws. If we are to avoid having this harm reach the proportions of a real national disaster within the next decade, we must move to make the social use of marihuana legal.

I ask for your comment on these two statements.

Dr. LEUCHTENBERGER. Well, on the first statement I would say no serious scientist at this time really could say that marihuana is harmless if you have no facts. And the second, I think in view of the evidence which was brought here today, and I believe there will be more, I think you cannot make such a statement. To me as a scientist, such statements as you read are absolutely incomprehensible, to say it in the most charitable way.

Mr. MARTIN. Thank you very much, Professor Leuchtenberger, for a very cogent presentation. I have no further questions.

Senator GURNEY. Mr. Sourwine.

Mr. SOURWINE. Mr. Chairman, I should like to ask that the four publications which the professor told us about in discussing her experiments be submitted for the subcommittee files and that they be inserted in this record as part of the appendix if space permits.

Senator GURNEY. They will be accepted.

Mr. SOURWINE. I would have this question in discussing your study No. 1, Professor, you spoke of the addition of marihuana to tobacco cigarettes. Did this mean that you used cigarettes composed of part marihuana and part tobacco?

Dr. LEUCHTENBERGER. Yes.

Mr. SOURWINE. Now, in discussing your results obtained in study 3, and I quote from your statement: "Furthermore, as seen in figure 6, inhalation of smoke from marihuana cigarettes produced a marked variability, an increase in DNA content in these bronchial cells." I am looking at figure 6 and I have a little difficulty understanding your statement. What is the control—is that the result with smoking tobacco cigarettes?

Dr. LEUCHTENBERGER. We have actually two controls. One which we call a negative control, which is nonexposed, and the second control is when you expose it to tobacco smoke.

Mr. SOURWINE. Well, your chart appears to show only one control, if I read it correctly.

Dr. LEUCHTENBERGER. Which figure?

Mr. SOURWINE. Figure 6, amount of DNA and size of nuclei in bronchiolar epithelial cells of Snell's controlled mice and after inhalation of fresh smoke from marihuana cigarettes.

Now, your control seems to be the amount of DNA and the size of the nuclei in the epithelial cells of Snell's controlled mice, is that correct?

Dr. LEUCHTENBERGER. Yes.

Mr. SOURWINE. Now, you say you have two controls. Is the other one reflected in any study?

Dr. LEUCHTENBERGER. We did not place it in this chart but after tobacco cigarette smoke we did not find any differences from the control in the bronchiolar tissue.

Mr. SOURWINE. I am trying to find out what figure 6 is. I know what it says at the top but you say that figure 6 shows that the inhalation of smoke from marihuana cigarettes produces a marked increase in DNA content.

Dr. LEUCHTENBERGER. Yes.

Mr. SOURWINE. A marked increase over what? Over the control? That is the area, the amount of DNA and the size of the nuclei in control mice?

Dr. LEUCHTENBERGER. It is DNA in content in the cells of mice which have not been exposed to marihuana cigarettes. This upper thing, this is the normal distribution which you will find in the DNA content in the bronchiolar cells.

Mr. SOURWINE. In other words, you used the same mice in one case, but in one test the mice had not been subjected to any smoke at all?

Dr. LEUCHTENBERGER. Yes.

Mr. SOURWINE. At the bottom, the mice had been subjected to marihuana?

Dr. LEUCHTENBERGER. Right.

Mr. SOURWINE. So that there is no comparison with cigarette smoke involved in figure 6 at all?

Dr. LEUCHTENBERGER. No.

Mr. SOURWINE. Well now, the control appears to range, the amount of DNA ranges as high as almost 40, and under the marihuana it never ranges above 20, but you say there was an increase. I cannot read the chart.

Dr. LEUCHTENBERGER. In the control, about 70 percent of the cells have an amount of DNA between 10 and 14, in arbitrary units. After marihuana you have no cells which have this amount of DNA; all the cells have a larger and variable amount.

Mr. SOURWINE. Well now, let us look at the size of the nuclei on the same chart, figure 6.

Dr. LEUCHTENBERGER. Yes.

Mr. SOURWINE. Your control ranged to about 38, if I read it correctly. Your size of the nuclei under the marihuana smoking ranged to about 32 or not more than 33?

Dr. LEUCHTENBERGER. No, this is the frequency in percent which you read. The main range of size of nuclei is between four and seven in controls, while after exposure to the marihuana the main range is from six to nine.

Mr. SOURWINE. All right, your figures, your blocks in black and your blocks in white, represent really two things, then. You may not read them as to height, you have to read them both horizontally and vertically at the same time?

Dr. LEUCHTENBERGER. Yes.

Mr. SOURWINE. And they represent. I see it reads here at the left, frequency in percent?

Dr. LEUCHTENBERGER. Yes.

Mr. SOURWINE. I must apologize for this line of questioning, but I dare say that if it confused me it might confuse others similarly unscientific who see one higher than the other when it says lower. I think I now understand it.

You are showing by this chart the total proportion of all your test cells that showed results in a certain range.

Dr. LEUCHTENBERGER. Yes.

Mr. SOURWINE. Is that correct?

Dr. LEUCHTENBERGER. Yes.

Mr. SOURWINE. I understand now. Thank you for explaining it. I have no further questions, Mr. Chairman.

Senator GURNEY. Well, I want to thank all of the members of the panel for coming here today and testifying on this very important subject of marihuana and its effect upon human beings. It is quite

obvious from the testimony today that what the subcommittee thought when we started the hearings, that is ,we do not know much about marihuana, is readily apparent. From what we do know about it, it looks as though we ought to get a lot more knowledge about it because indeed, the effect of marihuana upon humans may be quite serious. I am sure that these hearings—and we will have others—mark an initial and very important efforts in trying to find out the effect of this drug upon human society.

I do want to thank you so much for contributing to the knowledge of the subcommittee. Thank you.

The subcommittee hearing is adjourned at the call of the Chair.

[Whereupon, at 5:20 p.m., the hearing was adjourned, to reconvene at 10 a.m., Friday, May 17, 1974.]

[The following testimony was given on Monday, May 20. In accordance with the instructions of Senator Strom Thurmond, who presided, it is printed together with the testimony of the panel of medical researchers who testified on Thursday, May 16.]

TESTIMONY OF DR. JULIUS AXELROD, NATIONAL INSTITUTE OF MENTAL HEALTH

Senator THURMOND. Dr. Julius Axelrod, I believe, is our first witness. Doctor, we are honored to have you here and will be pleased to hear from you at this time.

Dr. AXELROD. I am honored to be here.

Mr. MARTIN. Dr. Axelrod, would you identify yourself briefly for the record?

Dr. AXELROD. I am chief of the section of pharmacology, laboratory of clinical science, the National Institute of Mental Health, United States Public Health Service.

Senator THURMOND. All right. Dr. Axelrod, where did you graduate from medical school?

Dr. AXELROD. I am not a medical doctor. I am a doctor of philosophy; I graduated from George Washington University.

Senator THURMOND. From George Washington University?

Dr. AXELROD. Yes.

Senator THURMOND. And you received your doctorate degree where?

Dr. AXELROD. From George Washington University.

Senator THURMOND. You obtained your bachelor of science degree at the City College of New York, did you?

Dr. AXELROD. Yes.

Senator THURMOND. Now, you pursued your scientific studies while working in various hospitals and institutes as laboratory assistant, research associate, and chemist, I believe?

Dr. AXELROD. Yes.

Senator THURMOND. Is that right?

Dr. AXELROD. Right.

Senator THURMOND. From 1953 to 1955 you were senior chemist at the National Heart Institute of the NIH?

Dr. AXELROD. Yes.

Senator THURMOND. In 1955 you received your Ph. D. from George Washington University, is that right?

Dr. AXELROD. Yes.

Senator THURMOND. Since 1955 you have been chief of the section on pharmacology, laboratory of clinical science, National Institute of Mental Health?

Dr. AXELROD. Yes.

Senator THURMOND. Doctor, you are the author or coauthor of more than 360 scientific papers, is that correct?

Dr. AXELROD. Yes.

Senator THURMOND. And you have been the recipient of numerous awards for scientific achievement, is that correct?

Dr. AXELROD. That is correct.

Senator THURMOND. And in 1970 you were awarded the Nobel Prize for physiology or medicine.

Dr. AXELROD. That's correct.

Senator THURMOND. Now, what was the specific accomplishment that brought you this award?

Dr. AXELROD. The elucidation of the chemistry of the nervous system, and studies of the effect of drugs on the brain.

Senator THURMOND. The effect of drugs on the brain?

Dr. AXELROD. Right.

Senator THURMOND. I see. Well, you may proceed with your statement, if you will.

Dr. AXELROD. Senator, I am honored to testify before this committee.

Senator THURMOND. Now, are you going to follow your statement strictly?

Dr. AXELROD. Yes, I am.

Senator THURMOND. Or would you just want to put it in the record?

Dr. AXELROD. I would rather read it, if I may.

Senator THURMOND. All right, you may proceed with your statement.

Dr. AXELROD. For many years our laboratory has been involved in biochemical and pharmacological investigations on drugs affecting the mind. We have developed very sensitive methods for measuring LSD and amphetamine in blood, urine, and tissues. These studies made it possible to establish how long these psychoactive drugs remain in the body, how much gets into the brain, and how the body disposes of them. Several years ago I found enzymes in the liver that detoxify narcotic drugs such as morphine, methadone, and demerol. More recently my colleagues and I demonstrated that drugs such as cocaine and amphetamine change the action of noradrenaline, a nerve chemical important for brain function.

Our interest in marihuana stemmed from the increasing use of the drug and the lack of knowledge concerning what happened to it in the body. The discovery that delta-9-tetrahydrocannabinol—THC—as the most active principal in the marihuana-containing cannabis plant and the chemical synthesis of this compound by the Israeli chemist, Mechoulim, made it possible to study its fate in the human body. The NIMH Drug Abuse Center made available to us as well as other investigators radioactively labeled delta-9-tetrahydrocannabinol. The availability of THC made it possible for the recent

rapid advances in our knowledge of the biochemistry, pharmacology, and behavior effects of this drug.

We developed sensitive methods to measure THC in blood and urine of man. After injection to human volunteers we drew blood samples periodically over a period of time and measured the THC content. After an intravenous injection of THC the amount of this compound in plasma rapidly declined during the first hour, with a half-life of 30 minutes. That means, half the drug disappeared within 30 minutes. After 1 hour the THC disappeared from the plasma and presumably from the body much more slowly, with a half-life of 60 hours. THC and its biochemically transformed products continued to be excreted in the urine for more than a week. The initial rapid decrease in the plasma represents a redistribution of marihuana active principals from the blood into tissues including the brain and also chemical transformation. The metabolic alteration of THC takes place mainly in the liver. In man the psychological effects of marihuana are greatest in 15 minutes after injection, begin to diminish after 1 hour and are largely dissipated by 3 hours. This is consistent with the initial fast disappearance of the drug from the blood.

The slower disappearance of THC from the body presumably represented retention in some tissue and slow release. The observation that THC and its transformation products persist in humans for long periods of time indicated to us that the drug and its metabolities would accumulate in some tissues when taken repeatedly. We then did a study to find out in what tissues THC is localized and whether its concentration builds up after repeated administration.

To gather this information, radioactive THC was injected into rats. After a single dose there was 10 times more of the drug in the fat than any other tissue examined. After repeated administration of THC there was a gradual and steady accumulation of the drug in the fat. After a single injection of THC there was barely detectable concentrations of THC in the brain, but after repeated administration there was a gradual accumulation of the drug in the brain.

THC when administered to man is almost completely transformed, mainly in the liver. The major metabolic product was identified as 11-hydroxy THC. This metabolite has been found in our laboratory and that of others to have essentially the same psychic effects, that is, as anxiety, euphoria, and pleasure. The intravenous administration of THC to chronic marihuana smokers resulted in a more rapid disappearance of THC from the blood, and at the same time there is a more rapid appearance of the physiologically active metabolite 11-hydroxy THC. This would suggest that repeated use of THC results in an increased capacity of enzymes in the liver to form this active metabolite.

After the injection of the active principal of marihuana, THC, there is a rapid distribution of the drug in tissues especially fat and metabolic transformation to active and inactive metabolic products. After repeated administration of THC is considerable accumulation and retention of the drug in fat and a smaller accumulation in the brain. Repeated administration of THC results in an increased capacity to form a psychologically active metabolic product.

Until recently there was little reliable information about the pharmacological, biochemical, and psychological actions of marihuana. Through the support of research by the U.S. Government for this important problem, increased knowledge is now becoming available. The medical, social, and legal aspects of marihuana are still highly complex and require continued study at all these levels.

Thank you. I will be happy to answer any questions, if you wish.

Senator THURMOND. Counsel will now propound some questions.

Mr. MARTIN. Doctor, there is no question in the scientific community that THC is a toxic substance?

Dr. AXELROD. No, there is no question.

Mr. MARTIN. There are, however, differences within the scientific community as to the degree of toxicity, and how the toxicity affects the body?

Dr. AXELROD. Yes.

Mr. MARTIN. Would it be a reasonable assumption for a scientist to make that the retention and accumulation in the brain of toxic substance would probably, over a period of time, lead to damage?

Dr. AXELROD. Yes, that's a good assumption.

Mr. MARTIN. But it has still to be demonstrated?

Dr. AXELROD. It has still to be demonstrated; yes, sir.

Mr. MARTIN. Is there any similarity between the manner in which THC accumulates in the tissue and the manner in which DDT accumulates?

Dr. AXELROD. Yes, both THC and DDT are fat soluble compounds, and because of this physical property are retained in fatty tissue.

Mr. MARTIN. This retention also affects the gonads, does it not?

Dr. AXELROD. Well, it depends. I have heard recent reports that marihuana lowers the male gonadal hormone, testosterone.

Mr. MARTIN. No, I am talking about that—it does accumulate?

Dr. AXELROD. Oh, yes, it would accumulate in gonads, the brain, and other tissues where there are large concentrations of fat.

Mr. MARTIN. Now, you had an opportunity, Dr. Axelrod, to examine briefly the testimony given to the subcommittee last Thursday by Prof. Robert Heath, who is chairman of the department of psychiatry at Tulane University. His testimony had to do with persistence of abnormal brain patterns in rhesus monkeys who had been subjected to marihuana smoke for a period of time. Dr. Heath told the subcommittee that these persistent alterations in the brain wave pattern pointed strongly to the conclusion that there had been perhaps irreversible damage to the brain. If this is the case, couldn't the accumulation of THC in the brain, which is established by your research, tie in with the changes referred to by Dr. Heath?

Dr. AXELROD. Yes; I would like to make a comment about Dr. Heath's report; may I?

Mr. MARTIN. By all means.

Dr. AXELROD. Now, one of the fundamental principles in pharmacology is the amount of a compound or drug that enters the body. You could take the most poisonous compound, and if you take too little, there is no effect. One may take a very supposedly safe compound, and if you give enough of it, it will cause toxic effects. This, I think, all pharmacologists recognize.

I respect Dr. Heath; he is a fine neurologist; but the doses he has given for the acute effect, for example, would be equivalent to smoking a hundred marihuana cigarettes, a very heavy dose of marihuana. And the amount he has given for the chronic effect represents smoking 30 marihuana cigarettes 3 times a day for a period of 6 months.*

The results indicate that marihuana causes an irreversible damage to the brain. But the amounts used are so large that one wonders whether it's due to the large toxic amounts Dr. Heath has given. I think it would be a better experiment if he had done what is done in pharmacology, a dose response; smaller amounts equivalent to that used by an occasional marihuana smoker and larger amounts used by a chronic smoker to see what levels would produce these irreversible effects. I hope that this will be done.

Mr. MARTIN. Thank you for your comment, Dr. Axelrod. But, I would like to point out that when Dr. Heath presented his report, he had to do it in 13 minutes; it was a very brief summary of a much longer study. I did have the impression from our questions afterward that the experiment was performed with doses of different calibrations.

Dr. AXELROD. Right.

Mr. MARTIN. And at different levels, and maybe that is not reflected in the paper itself. Evidence has also been given during the hearing. Dr. Axelrod, by Dr. Nahas of Columbia University, and recent research indicated that marihuana inhibits human cell immune response mechanism and reproduction. Does this also tie in with the findings of your research and the findings of Dr. Heath's research?

Dr. AXELROD. Yes.

Mr. MARTIN. Isn't there a pattern relating to permanent damage of the brain?

Dr. AXELROD. Yes, perhaps this would be so. Again, I would like to qualify my statement. Dr. Nahas is a very fine scientist but these findings need repetition and confirmation.

Mr. MARTIN. By all means. I might point out that quite a few of the scientists made the point, although it was clear they were pretty well convinced by the findings, the research had to be considered preliminary for the time being. Nevertheless, there was enough evidence from preliminary research to bring it to the attention of the public.

Dr. AXELROD. I absolutely agree.

Mr. MARTIN. Do you agree with that?

Dr. AXELROD. I agree that taking marihuana in large doses is harmful, and the evidence is becoming pretty compelling. But, one has to remember that one has to distinguish between a small innocuous dose taken by an occasional marihuana smoker and a large repeated dose.

Mr. MARTIN. I have no further questions, Mr. Chairman.

Senator THURMOND. Doctor, I want to thank you very much for your testimony here today; we appreciate your appearance.

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*The question raised by Dr. Axelrod about the dosages employed in the Heath experiment was the subject of a subsequent commentary by Professor Heath, mailed to the subcommittee on July 9, 1974. The text of this commentary is to be found in the appendix on page 382.

MARIHUANA-HASHISH EPIDEMIC AND ITS IMPACT ON UNITED STATES SECURITY

FRIDAY, MAY 17, 1974

U.S. SENATE,
SUBCOMMITTEE TO INVESTIGATE THE
ADMINISTRATION OF THE INTERNAL SECURITY ACT
AND OTHER INTERNAL SECURITY LAWS
OF THE COMMITTEE ON THE JUDICIARY,
Washington, D.C.

The subcommittee met, pursuant to recess, at 10 a.m., in room 2228, Dirksen Senate Office Building, Senator Edward J. Gurney presiding.

Also present: J. G. Sourwine, chief counsel; David Martin, senior analyst.

Senator GURNEY. The subcommittee will come to order, please.

I wish we could come to order because we are wasting time.

Would you gentlemen rise, please?

Will you all raise your right hands?

Do you swear to tell the truth, the whole truth, and nothing but the truth, so help you God?

[All witnesses replied "I do."]

Senator GURNEY. Thank you.

We have a long series of witnesses here today, as we know, and I have obligations that require me to leave for Florida early in the afternoon so I would hope we could be as speedy and as brief as we can, and, in no way underestimating the extreme importance of this testimony, but, as I say, try to get our facts out as quickly as we can.

The first witness will be Dr. Hall.

Dr. Hall, will you identify yourself for the record, please? You don't have to stand up, just state who you are, you know, your name, where you reside.

TESTIMONY OF DR. JOHN A. S. HALL, JAMAICA

Dr. HALL. I am Chairman of the Department of Medicine at the Kingston Hospital in Jamaica.

Senator GURNEY. And I will ask a few questions, Dr. Hall, to establish your qualifications here.

As I understand it, you received your medical degree from the University of London, King's College, in 1951?

Dr. HALL. That is correct.

Senator GURNEY. And you went on to take a diploma in neurology from the London Medical School in 1958?

Dr. HALL. That is correct.

Senator GURNEY. Subsequently you had Observation Fellowships in Neurology at the Neurological Institute in New York, at the Department of Neurology in Pennsylvania Hospital, and at the Beaumont Hospital, University of Lausanne, in Switzerland?

Dr. HALL. That is correct.

Senator GURNEY. And you served as medical officer in the Ministry of Health in Jamaica from 1952 to 1960?

Dr. HALL. Correct.

Senator GURNEY. And you are currently Associate Lecturer in Medicine at the University of the West Indies and Visiting Assistant Professor of Neurology at Columbia University?

Dr. HALL. Correct.

Senator GURNEY. And you have been senior physician and elected Chairman of the Department of Medicine of the Kingston Hospital, in Kingston, Jamaica, since 1965?

Dr. HALL. Correct.

Senator GURNEY. Would you proceed with your statement, Dr. Hall?

Mr. SOURWINE. Mr. Chairman, may I venture a suggestion?

Senator GURNEY. Yes, indeed.

Mr. SOURWINE. The Chair might wish to order that all of the prepared statements go into the record as though read at the beginning of each witness' presentation, leaving him free to repeat the statement or ad lib or make emphasis and instruct integration of the two when the record is corrected for printing so that nothing will be lost and time might be saved.

Senator GURNEY. That is a good suggestion, Mr. Counsel, and that is so ordered.

Dr. Hall.

Dr. HALL. Mr. Chairman, may I thank you and your staff for giving me this opportunity to appear on this distinguished panel.

In a previous publication I pointed to the fortuitous introduction of ganja or marihuana into Jamaica in the 18th century as a possible source of fiber plant, by the English plantation owner, Matthew Walker at his botanical gardens in Gordon Town, near Kingston.

The Indian connection following the arrival of indentured laborers at the end of the last century is established historical fact.

Senator GURNEY. Doctor, I wonder if you could point that microphone directly into your mouth so that it will pick up your voice just a little better.

Dr. HALL. Quiet acceptance and public indifference to the use of ganja continued until 1954 when the village, Pinnacle, in the hills of St. Catherine some 20 miles from Kingston, was destroyed by a police raiding party. The village had become notorious as the home of praedial larceny, a center for the propagation and use of ganja, and the headquarters of the Rastafari cult.

The resulting dispersal of the Rastafari cultists into the urban slums of Kingston, and into rural areas, was to have far-reaching consequences, as has been published in data elsewhere.

I became interested in cannabis as a clinical problem because of:
(1) Its ready availability in Jamaica; it grows in any backyard and in the wooded forests.
(2) Ill-defined and undocumented clinical manifestations;
(3) Lack of a definite laboratory test for identifying it;
(4) Bizarre, sometimes short-lived confusional states seen in urban and rural practice;
(5) Folklore; and
(6) The impact of American cultural mores on our island community.

With these factors in mind I have over the years inquired routinely of all patients at initial interview whether they smoke ganja or drink ganja tea. The Department of Medicine at Kingston Public Hospital sees 12,000 outpatients at its clinics annually.

My team sees approximately 5,000 of these patients, who represent a spectrum ranging from the unemployed ghetto dweller to the upper middle class.

It has been possible therefore:
(a) To arrive at a relative incidence of ganja usage
(b) To study the motivation for its use
(c) To identify clinical pictures with which its use is associated more often than coincidence will allow
(d) To do certain laboratory studies
(e) To gain some insight into its psychocultural effects.

Ours is an adult clinic. Males are almost exclusively smokers of ganja although urbanization and fashion are causing other trends. These males come from the social spectrum indicated above. The age range was 15-65 years.

Ganja tea is used about equally among working class men and women. In the first 4 months of this year, for example, there were just over 35 self-confessed ganja users among just over 1,000 clinic patients. This incidence of 3 percent contrasts with other reports of widespread use, and is in line with the incidence say of Parkinsonism which constitutes 2.5 percent of my clinic population, and is an uncommon condition in Jamaica. It is accepted that the clinic population is not all embracing; but if this figure were even tripled, we arrive at 9 percent.

Motivation for the use of ganja is summarized as follows:
1. Curiosity.
2. Conformity with the group; social, religious, political.
3. Relief of tension.
4. Stimulation of thought and physical activity.
5. Folk medicine.

In our observation, dosage depends on:
1. Manner and frequency of use.
2. Variations in dosage per se.
3. Potency of preparation smoked or brewed.
4. Unreliable retrospective recall of frequency of use.
5. Technique of smoking.
6. Personal and intragroup variations.
7. Limitations of costs.
8. Legal strictures against the possession and use of ganja.

It is noteworthy that a joint, or marihuana cigarette costs in our situation 40 to 50 cents, while a bottle of beer costs 25 cents and a quart of rum costs $1.80. A chillum pipeful of dried leaves is equivalent to about five cigarettes. To reach the same "high" using alcohol or ganja, the cost would be more with ganja. This challenges a point made by others that ganja is the poor man's substitute for alcohol.

Significantly none of these patients has been exposed to amphetamines, LSD, heroin, or other hallucinogens. Those interviewed could do without ganja for long periods of months at a time. Ritual smokers also knew when they had had enough.

My findings were essentially nonclinical and clinical.

The nonclinical findings related mainly to (1) Educational level; (2) occupational status; (3) marital status; (4) criminal record, on which I have commented in a previous publication.

The levels that are quoted were quite low but certainly are not universally applicable as broader observation at the clinic, community or national level could indicate. The same observations would apply to criminal record.

Clinical findings were certainly more significant and were divided into immediate and long-term findings.

The immediate findings have been fully corroborated by other people who have found autonomic overactivity as shown by pupillary dilation, conjunctival suffusion, profuse diaphoresis, tachycardia, and mild hypotension. Shortly after these some of my cases showed hypothalamic overactivity, that is mild euphoria; others showed medullary stimulation by way of sedation or acute vomiting.

The long-term effects were also quite remarkable. There were:

1. RESPIRATORY COMPLICATIONS

An emphysema-bronchitis syndrome, common among Indian laborers of a past generation, who were well known for their ganja smoking habits, is now a well recognized present day finding among black male laborers. Indeed, one of our cases died from acute pulmonary embolism and at autopsy demonstrated spontaneous trombosis of the pulmonary artery. In the autopsy room in general, the barrel-shaped, emphysematons, chest, is a common finding in Rastafarian cultists. This raises questions of their smoking habits and the possible action of toxic metabolities from ganja acting on the pulmonary parenchyma, a point which was substantiated by one of yesterday's speakers, Dr. Leuchtenberger.

2. G–I TRACT INVOLVEMENT

In the small sample series two cases previously published had radiologically proven duodenal ulcers also raising the question of toxic metabolites, vagal stimulation, or a parallel to the excretion of morphine in the stomach.

Further observation suggests a greater association between duodenal ulcer and ganja smokers, attending the clinic, than coincidence would allow. Detailed studies of gastric fluid and gastroscopic studies are clearly indicated.

3. METABOLIC EFFECTS

Among chronic ganja smokers obesity is never seen. The Rastafari cultists fully substantiate this point of the slim body build. Constant craving for sugar cane, highly sweetened beverages, or sweets is noted in many habitual smokers and cultists after smoking ganja. Many smokers also allege an increase of appetite. Persistent observations on our part of the absence of obesity suggest some interference with the metabolic pathways for depositing body fat. The PBI studied in a small series to date has not indicated thyroid hyperactivity and comment was made yesterday by one of the speakers on this interference with fatty metabolism.

4. CNS CHANGES

Ganja has long been regarded both by the laity and the profession as a cause of psychosis in Jamaica. The unrivaled, accumulated, experience of Cooke, Royes, and Williams, who were in recent years senior medical officers at the Bellevue Hospital, in Kingston, Jamaica, fully substantiates this. The observations also of Prince, Greenfield, and others corroborate this view. There is also the Moroccan report of Benabud. It is a common experience in my wards, three to six cases per year of ganja psychosis being referred to the psychiatry clinic. This was noted in my preliminary report on ganja smoking in Jamaica. My experience can be readily duplicated in hospitals around Jamaica. It is noteworthy that a survey in a village of relatively well peasant farmers, for instance, might be misleading.

An incidence of 20 percent impotence as a presenting feature among males who have smoked ganja for 5 or more years, was reported by me earlier. Several colleagues in private practice have been alerted to this and tend to corroborate my view of this problem. The difficulties of assessing this symptom are self-evident. The likely involvement of the autonomic pathways awaits neuropathological studies.

Personality changes among ganja smokers and members of the Rastafari cult are a matter of common observation in Jamaica. The apathy, retreat from reality, the incapacity or unwillingness for sustained concentration, and the lifetime of drifting are best summed up in the "amotivational syndrome" of McGlothin & West.

Many smokers come to no grief, as it were, after several years of ganja use. On this basis some workers, and the media make a fashionable virtue of its use; they recommend it as a panacea for poverty, or a benevolent alternative to alcohol. This view is, at best, half truth. Common observation in Jamaica is that ganja smoking can be a catalyst for cataclysmic change for ill in the life of a ganja smoker. The Rastafarians to whom I have referred earlier in particular typify this picture. Those interested can refer to the work of Smith, Augier and others, and Kitzinger, previously published.

Mr. Chairman, I have documented some laboratory data which I shall ask to be incorporated in the record, but I draw particular attention to hypoglycaemia, that is to say, a fall in the normal blood sugar which was seen in three of eight cases, 1 hour after smoking 25 grams of dried ganja leaf in a standard pipe.

Mr. MARTIN. Is this a major drop in blood sugar level?

Dr. HALL. Below the normal accepted level.

Mr. MARTIN. But a substantial drop?

Dr. HALL. Yes, of, say, from 120 before smoking to levels of 50 or less within an hour of smoking 25 grams of the dried leaf.

Mr. MARTIN. Within 1 hour of smoking?

Dr. HALL. Precisely.

May I continue?

Mr. MARTIN. Please.

Dr. HALL. This raises a question of the relevance of repeated hypoglycaemia to personality changes and psychoses well documented by others.

Mr. Chairman, the dilemma facing most societies regarding the legalized or uninhibited use of ganja is created, in my view, by vested interests and the media. In my country, Jamaica, many people do smoke ganja, I repeat, without apparent ill effects. There is, however, a growing number of young adults especially who are being pushed over the edge of the abyss, and are hanging in there in a world of chemically-induced, drug-induced, fantasy and nonproductivity.

One can visualize at the national level ganja smoking changing the life style of a society, undermining economic productivity, and impairing a country's military effectiveness.

One can visualize too, a totalitarian regime promoting it as an emotional escape valve, rather like institutionalized festivities.

In Jamaica the vast silent majority recognize all these points and are not confused. They recognize the liaison and involvement with crime both local and international.

In my view they are determined to preserve the Judeo-Christian ethic of pleasurable reward for hard work and the competitive, achievement-oriented value system.

Thank you, Mr. Chairman.

Senator GURNEY. Thank you, Dr. Hall, for your remarks.

Mr. MARTIN. Dr. Hall, as you know, there is a widespread impression in our country that almost the entire Jamaican population is caught up in an endemic marihuana binge—that all Jamaicans are on ganja.

Your statement suggests this is very much exaggerated. If I understood you correctly, you estimate the percentage of the population on ganja to be somewhere between 3 percent and 9 percent, based on your continuing study of the hospital population.

Dr. HALL. That is correct, sir.

The impression of widespread use is created mainly by the publicity given to visitors from North America who have found Jamaica a "locus classicus" for obtaining and smoking ganja.

Mr. MARTIN. The tourists have no trouble getting ganja and marihuana in Jamaica?

Dr. HALL. None whatever, and frequently get into trouble with the law.

Mr. MARTIN. And ganja has no serious trouble getting from Jamaica into the United States? As you know, there is an increasing amount coming into our country.

Dr. HALL. There is a well-established traffic.

Senator GURNEY. Incidentally, on that question, Dr. Hall, my State is the State of Florida. One of the principal sources of flow into Florida is Jamaica, this is a well-known fact. Is your government doing anything to interdict this flow of marihuana into Florida?

Dr. HALL. Yes, I am in a position to speak of that. The Government is taking the most stringent measures to intercept international shipments coming by private aircraft and presently there are some very serious cases before the courts at this moment.

Senator GURNEY. They are making a good effort to try to stop this?

Dr. HALL. Very much so, Mr. Chairman.

Senator GURNEY. Thank you.

Mr. MARTIN. Jamaican marihuana is pretty good stuff, as they say. It is supposed to be substantially stronger than Mexican marihuana, is that correct?

Dr. HALL. That has generally been said, but I have myself no figure as to the quantum of THC in our ganja.

Mr. MARTIN. The fact that Jamaica has a relatively large population of chronic smokers, perhaps not as an overall percentage but you have a population of chronic smokers going back many years, this affords certain advantages in studying the long-term impact of chronic marihuana smoking?

Dr. HALL. Decidedly so.

Mr. MARTIN. You may be aware, Dr. Hall, of a recent study which has been reported on in the American press, a study done in Jamaica funded by the National Institute for Mental Health. This study, as you know, came up with the nearest thing to a clean bill of health that has yet been published—no change in functional ability, no change in respiratory function, no change in chromosomes—the nonsmokers suffered more chromosome damage than the smokers—no change in brainwave patterns, nothing at all.

Do you know anything about this study?

Dr. HALL. Yes, I am familiar with it.

Mr. MARTIN. Do the implications of this study—well, from what you have said here, the implications certainly do not conform to your own experience with thousands of marihuana smokers?

Dr. HALL. That is correct.

The study to which you refer does not have the general support of experienced clinicians and other workers in the field. We believe that the selection with which the study was done was faulty and that in regard to the reported absence of any change in the chromosome pattern that their technique was faulty and that certainly as regards the statement that there was no respiratory effect, it is unfounded.

Mr. MARTIN. From your experience and contacts you believe that the great majority of doctors in Jamaica who have had actual experience with marihuana smokers—ganja smokers—are convinced that it has a substantial negative effect?

Dr. HALL. That is correct.

Mr. MARTIN. Thank you very much.

I have no further questions.

Senator GURNEY. Mr. Sourwine.

Mr. SOURWINE. I have no questions, Mr. Chairman, but I respectfully suggest that the study which was the subject of the last question has not been identified for the record. It is not the usual thing, as the Chair knows, for the committee to shoot arrows into the air. If the witness credits a study, the record ought to show what the study is.

Senator GURNEY. Could you identify the study, Dr. Hall?

Dr. HALL. The study about which I was speaking was a study mounted by Professor Beaubrun, Vera Rubin and Comitas.

I believe they were funded by one of your national agencies.

Senator GURNEY. When was the study made?

Dr. HALL. It was reported in 1972 and serialized in our national press.

Senator GURNEY. Do you know how long they spent on this study?

Dr. HALL. Some months in 1971.

Senator GURNEY. Thank you, Dr. Hall.

Dr. HALL. Thank you.

Senator GURNEY. Our next two witnesses are Dr. Harold Kolansky and Dr. William Moore of Philadelphia, who are psychiatrists who have worked as a team in studying the effects of marihuana chronic users and they have coauthored a series of articles in the medical journals on this subject.

As I understand they are going to testify as a team today.

There wasn't time for the committee to receive your biographical statements, Dr. Kolansky and Dr. Moore, so I wonder if for the record, you could state your qualifications.

TESTIMONY OF DR. H. KOLANSKY AND DR. WILLIAM MOORE, PHILADELPHIA, PA.

Dr. KOLANSKY. Thank you, Mr. Chairman.

Senator GURNEY. First of all, would you state your name?

Dr. KOLANSKY. My name is Harold Kolansky, and I have a doctor of medicine degree from Georgetown University School of Medicine in this city, 1948.

I interned at the Walter Reed Army Hospital 1948 to 1949, and had residency in psychiatry at the Veterans Hospital in the Philadelphia area and in several of the medical schools. After the 1949 period I also served in the armed services as a captain, and psychiatrist and chief of psychiatry for the Fourth Field Army Hospital in Korea during the Korean conflict, and was at that time also chief psychiatrist to the Eighth Army Surgeon.

Subsequently, I was at the Albert Einstein Medical Center in Philadelphia while also in private practice from the year 1952 and continued in the private practice of psychiatry and child psychiatry and psychoanalysis since that time.

I was director of child psychiatry from 1955 until 1969 at the Albert Einstein Medical Center and was chairman of the department of psychiatry there from 1968 to 1969.

I have been twice president of the Regional Council of Child Psychiatry, most recently a year ago, and that embraced the Penn-

sylvania, southeastern New Jersey and Delaware communities of child psychiatrists, and currently am chairman of the Continuing Education Committee and a council member of the American Academy of Child Psychiatry. I am certified in psychiatry and in child psychiatry by the American Board of Psychiatry and Neurology and have the equivalent of certification through the American Psychoanalytic Association in both child and adult psychoanalysis.

I am currently associate professor of psychiatry at the University of Pennsylvania School of Medicine, and simultaneously chairman of the Curriculum Committee on Child Analysis of the Institute of Philadelphia Association for Psychoanalysis where I also teach.

In the last 9 years in the private practice of psychiatry and in hospital work as well, Dr. Moore and I have been collaborating in our observations on marihuana in our practices with patients who have come to us and we will have more on that in our prepared statement.

If I may suggest, Mr. Chairman, Dr. Moore would give his background and curriculum, following which Dr. Moore would give the first half of our prepared statement and then I would give the second half.

Senator GURNEY. That is fine.

One other question, Doctor, have you been the author or coauthor of scientific or medical articles in your career?

Dr. KOLANSKY. I didn't hear your last word, Mr. Chairman.

Senator GURNEY. Have you been the author or coauthor of scientific or medical articles or papers?

Dr. KOLANSKY. Yes, sir.

I have been the author of some 40 clinical and research papers in psychiatry, child psychiatry, and psychoanalysis. Of these five have been coauthored with Dr. Moore on the subject of marihuana.

One is in press, four have already been published, and additionally Dr. Moore and I have collaborated on other subjects within the field of psychiatry and psychoanalysis which have been published.

Senator GURNEY. Thank you, Doctor.

Dr. Moore, would you give your background and qualifications and then proceed with your statement.

Dr. MOORE. I am William T. Moore, a doctor of medicine, graduated from the University of Pittsburgh in 1947. I have been a practicing psychiatrist and psychoanalyst since 1950. I am certified in both adult and child psychiatry by the American Board of Neurology and Psychiatry. I am a qualified psychoanalyst, in the practice and treatment of children and adults as well as study in clinical research.

I've been on the full faculty of the Institute of Philadelphia Association of Psychoanalysis since 1960. I have been the director of training for the past 5 years for the division of child analysis at the Institute of Philadelphia Association for Psychoanalysis. I have been associate professor in child psychiatry in the Hahnemann Medical College for 13 years up until 1972, and presently associate professor in clinical psychiatry at the University of Pennsylvania School of Medicine.

I have coauthored and authored a number of scientific papers, some with Dr. Kolansky and some alone. Since 1964, I have been quite intensely interested in and actively studying as well as treating adolescents and young adults involved in drug use and particularly involved in marihuana use and abuse.

I have been particularly interested in the psychological effects of adolescent involvement, and the mental functioning in young adults as a result of marihuana use.

Mr. MARTIN. Dr. Moore, may I suggest that you move the microphone a bit closer and raise your voice a bit so the audience can hear you?

Dr. MOORE. Closer, like that?

Mr. MARTIN. Yes.

Dr. MOORE. I have been in active clinical study with Dr. Harold Kolansky for the past 10 years on this marihuana issue.

Mr. Chairman and members of the subcommittee, we are pleased to present a summary of our psychiatric findings in those who use marihuana.

You are already familiar with Dr. Olav J. Braenden's work and statement to this subcommittee on September 18, 1972. Based on his laboratory, and coordinating work for the United Nations, and on his direct contact with Drs. Paton, Rafaelson, Miras, and Salamink, all of whom were doing current research on cannabis, he stated that among scientists working in the field, the consensus was that cannabis is dangerous. He also said that as more scientific data accumulated, the knowledge of the potential dangers increases.

He indicated that contrary to former views, there are at least 50 substances in cannabis—and he implied that many of them could be toxic. He quoted the work of Dr. Campbell and his colleagues, who showed rather definitively the result of cerebral atrophy in young, chronic marihuana smokers. We would add that the skull X-rays showing the enlarged ventricles—due to atrophy—of these patients in the Campbell article, are vividly dramatic. We would also like to add that, the British journal, Lancet—December 4, 1971—editorialized Campbell's work, and said.

> The paper by Dr. Campbell and his colleagues in this issue deserves careful scrutiny . . . The atrophy is significant, and the difference from the normal air encephalogram entirely justifies the authors' description and diagnosis.

We concur with Dr. Braenden and the other investigators, and are convinced that marihuana smoking carries enormous risks of physical and mental damage. In our four published and a fifth currently in press clinical papers on marihuana use we have spelled out the psychiatric findings, and offered an hypothesis on its toxic effects on the brain.

In an editorial in the Journal of the American Medical Association—JAMA, October 2, 1972, volume 222 1—concerning our work, the editor said.

> Uncertainty about the potential dangers of marihuana usage prevails among physicians and others. There are some * * * who contend that the drug's psychotropic effects are no more serious—perhaps less serious—than those of alcohol, and that, since alcoholic beverages are sold throughout the United States, sale of marihuana should be legalized.

In this issue of the Journal p. 35, Kolansky and Moore report observations on 13 patients who had smoked marihuana or hashish intensively for periods from 16 months to 6 years. All manifested severe symptoms of cerebral toxic reaction that disappeared within 3 to 24 months after cessation of drug use.

Spokesmen who espouse tolerance toward "occasional" or "moderate" use of marihuana should be mindful of the possibility that, for whatever reasons, occasional may become "frequent" and moderate may become "intensive," with forbidding consequences. Moreover, if sale of marihuana were legalized, would hashish—a much more potent form of cannabis be far behind? * * *

If marihuana ever were given the same legal status as alcoholic beverages, nothing could be said except "Buyer beware."

Exactly 3 years ago today on May 17, 1971, we presented a report to the National Commission on Marihuana and Drug Abuse. At that time we presented our findings on a 5-year clinical study of 38 patients, ages 13 to 24 showing that marihuana alone caused serious psychological and neurological effects. We told the Commission that marihuana and hashish have a chemical effect that produces a brain syndrome marked by distortion of perceptions and reality.

This leads to an early impairment of judgment, a diminished attention and concentration span, a slowing of time sense, difficulty with verbalization, and a loss of thought continuity characterized by a flow of speech punctuated with non sequiturs, which leaves the listeners puzzled. In time, the chronic smoker develops a detached look as decompensation of his ego or character occurs.

In the last 9 years we have seen hundreds of patients who have suffered psychiatric and neurological symptoms as a result of marihuana use, and have described the findings in almost 60 of these patients, in our publications.

Senator Gurney. You mentioned decompensation of his ego occurs. Would it be better perhaps for a layman like me to say the disintegration of himself as a human being?

Dr. Moore. A disintegration of his character.

Senator Gurney. Thank you.

Dr. Moore. Although we described the deleterious effects of cannabis use on adolescent personality development in psychological terms when we spoke to the National Commission, even then we stressed our clinical hypothesis that psychic changes were a result of a chemical damage to the cerebral cortical cells.

We further indicated that the symptoms described by us should not be confused with the usual psychological phenomena, characterized as either developmental changes or psychological aberrations. All the individuals studied showed some uniformity of symptom response which to us implied that a common toxic agent—cannabis—was responsible for the observed reaction. We also considered the possibility that similar reactions might occur in any one who intensively used cannabis for an extended period of time. We said at that time:

During the past six years we have seen a clinical entity different from the routine syndromes usually seen in adolescents and young adults. Long and

careful diagnostic evaluation convinced us that this entity is a toxic reaction in the central nervous system due to regular use of marihuana and hashish.

Contrary to what is frequently reported, we have found the effect of marihuana to be not merely that of a mild intoxicant which causes a slight exaggeration of usual adolescent behavior, but a specific and separate clinical syndrome unlike any other variation of the abnormal manifestations of adolescence. We feel there should be no confusion, because regardless of the underlying psychological difficulty, mental changes—hallmarked by disturbed awareness of the self, apathy, confusion and poor reality testing—will occur in an individual who smokes marihuana on a regular basis whether he is a normal adolescent, an adolescent in conflict, or a severely neurotic individual.

We were very disappointed in the ambivalent report made by the National Commission, after 2 years of hearings and study, in which inadequate attention was paid to the clear evidence presented by investigators to the effect that cannabis is retained in brain and other tissue, is toxic and may cause irreversible brain damage. We also believe that the right of the public to be educated to these toxic effects is long overdue, and that the Commission failed to organize this effort.

With increasing frequency, we were seeing adults who also smoked marihuana, and who developed changes in personality believed to be due to toxicity we described in JAMA on October 2, 1972——

Mr. Martin. That is the Journal of the American Medical Association?

Dr. Moore. Yes, sir.

We described 13 adults between the ages of 20 and 41 years, all of whom smoked cannabis products intensively—3 to 10 times per week—for a period of 16 months to 6 years. They all demonstrated symptoms that simultaneously began with cannabis use and disappeared within 3 to 24 months after cessation of drug use.

In addition, a correlation of symptoms was observed in relation to the duration and frequency of smoking. When coupled with the stereotyped nature of the symptoms regardless of psychological predisposition, a consideration of biochemical and structural changes in the central nervous system—possibly cerebral cortex—as a result of intensive cannabis use seemed to be in order. We said it would appear that the present medical and public approach to education regarding the danger of marihuana use should undergo some reassessment.

In that article we tentatively classified our findings as follows:

1. Biochemical change. Those cases in which symptomatology indicated less chronic or less intensive use of cannabis or both, and the patients developed total remission of symptoms within a 6-month period following the termination of drug use.

2. The second group would be those with biochemical change with suspected structural change. Those cases in which symptomatology indicated chronic intensive cannabis use; then upon termination of drug use, only partial remission of symptoms were evident after 6 months but no residual symptoms were found after 9 months.

3. Biochemical change with possible structural change—those cases in which symptomatology indicated chronic intensive cannabis use; then upon termination of drug use, partial remission of symptoms occurred after 6 months and residual symptoms were still present after 9 months or more.

Dr. Kolansky will take it from there.

Senator Gurney. Dr. Kolansky.

Dr. Kolansky. Thank you, Dr. Moore.

Among the symptoms shown by most of our patients, are those we described in 1972.

With a history of regular marihuana or hashish use—3 to 10 or more times a week—the individual was characteristically apathetic and sluggish in mental and physical responses. There was usually a loss of interest in personal appearance and a goallessness.

Considerable flattening of affect—emotion—at first gave an impression of calm and well-being so that the patient seemed to be at peace with himself and the world. This was usually accompanied by his own conviction that he had recently developed an emotional maturity and insight that was aided by or even a result of his generous use of cannabis. Having found his "true self," he claimed that his aggression, ambition, and life goals no longer needed to follow those of the mainstream of society. We considered this to be a defensive use of denial and reaction formation in order to avoid an outbreak of aggression due to diminished stability in his personality organization.

His pseudoequanimity was easily disrupted when his personality change, new philosophies, and drug consumption were questioned by old acquaintances or by family members. Also if anyone posed a threat to his supply of cannabis his peaceful facade quickly gave way to irritability or outbursts of irrational anger frequently accompanied by vituperative verbal attack or sullen petulance.

Many of those we examined were physically thin and often appeared so tired that they simulated the weariness and resignation of some of the aged. All appeared older than their chronological age by appearance, and an impression that was sometimes reinforced by slow physical movement. We thought such slow motion resulted from a combination of an emotional lethargy and a slowing of the sense of time; this latter effect had been cited previously by Melges, et al., as also contributing to mental confusion in cannabis smokers.

Frequently our patients complained of tiredness, sleeping during the day, and wakefulness at night which seemed similar to the reversal of sleep cycle referred to by Dr. Campbell and others as a symptom of cerebral organicity.

Mr. Martin. By organicity you mean organic damage?

Dr. Kolansky. Organic damage in the brain.

Mr. Martin. Thank you, Doctor.

Dr. Kolansky. The symptoms of mental confusion, slowed time sense. Difficulty with recent memory, and the incapability of completing thoughts during verbal communication that resulted in confused responses, seemed to imply some form of organic change either of an acute biochemical nature as noted in cases with shorter histories of cannabis use or, one might hypothesize, structural encephalopathy when found in cases with prolonged heavy marihuana use.

Mr. Martin. Again encephalopathy means pathological damage to the brain?

Dr. Kolansky. That is correct, sir.

We are certain that these symptoms cannot be explained simply on the basis of psychological predisposition. Headaches, also described by Campbell and his coworkers were common. In one of our cases—not reported in this series—the marihuana syndrome masked a severe obsessional neurosis that was present before marihuana syndrome masked a severe obsessional neurosis that was present before marihuana use, then reappeared after cessation of drug use. During marihuana toxicity, his obsessional thinking and compulsive behavior were minimal and secondary to the stereotyped symptoms described above.

We said in 1972 in the Journal of the American Medical Association:

The intensity of symptoms and the presence of delusional content during use of the drug seemed directly related to the frequency and length of time that cannabis had been used. There also seemed to be some relationship between symptom intensity and the strength of the drug that was used. Those who smoked hashish seemed to be more symptomatic. The length of time necessary for the remission of symptoms also appeared to be directly related to the duration and frequency of smoking.

In addition, the presence of residual symptoms 9 months after the use of cannabis was stopped showed some relationship of the symptom residual to the duration and frequency of exposure.

Lemberger and others at the National Institute of Mental Health have shown that chemical constituent delta–9 tetrahydrocannabinol is maintained in the brain and other organs of humans for up to 8 days after ingestion. McIsaac and his coworkers in 1971 showed with isotope labeled cannabis that concentration of the drug occurred in the frontal lobes and cortice of monkeys. Campbell and his coworkers in 1971 have pointed out that findings that indicate the fat solubility of cannabis derivatives makes it likely that the accumulation of this drug in nervous tissue would thereby cause a cumulative chemical effect. This cumulative effect seemed to be demonstrated clinically by those cases in this report who had relatively brief histories of smoking cannabis.

In these individuals the biochemical effect is less likely to be confused by later structural change. During the period of time between cessation of drug use and symptom remission, those symptoms present are probably due to the effect of accumulated chemical effect rather than structural changes. In addition, a number of patients, all told of sometimes feeling some of the effects of cannabis for several days after their last smoke.

Rosenkrantz, et al., indicated that in the brain tissue of rats examined, there was a consistent severe loss of brain protein and cell component RNA that play basic roles in brain functioning.

The occurrence of a stereotyped group of symptoms unrelated to psychological predisposition in a number of individuals following chronic and extensive cannabis use seems to us to at least imply the possibility of a similar biochemical application in humans. In those cases where symptomatology, though diminished, was still present 6 months, 9 months, and 1 year after drug withdrawal raises an important possibility of more permanent structural changes in the cerebral cortex, such as reported by Campbell, et al., all of whom smoked 3 or more years and all of whom showed radiologic evidence of cerebral atrophy.

In the last 2 years, we have seen much additional marihuana smoking in two particular groups—those in junior high school, and those in the 20 to 40 year group. In the younger group our concern for impairment of adolescent development is strong. We said even in 1971 in our acticle in the Journal of the American Medical Association, and I quote:

Clearly, there is, in our patients, a demonstration of an interruption of normal psychological adolescent growth processes following the use of mari-

huana; as a consequence, the adolescent may reach chronological adulthood without achieving adult mental functioning or emotional responsiveness.

One month ago, April 18, 1974, a paper in the New England Journal of Medicine, "Depression of Plasma Testosterone Levels After Chronic Intensive Marihuana Use," by Dr. Kolodny and his group gave additional cause for concern in the older age group, and by implication in the adolescent age group as well, when the authors described 20 heterosexual men 18 to 28 years of age who used marihuana at least 4 days weekly for 6 or more months, who showed decreased testosterone levels that were dose related. Six of 17 men—35 percent—showed a marked drop of sperm count, with the count being lowest in those who smoked most.

In addition to temporary sterility, these authors described two subjects who were also impotent. The authors caution about marihuana use in pregnant women, since delta–9 THC can cross the placental barrier, and so possibly depress fetal testosterone levels during critical stages of sexual differentiation. They also express concern about a delay in a completion of puberty in the prepubertal youngster who smokes.

In concluding our prepared statement, we would like to paraphrase and add to a series of recommendations offered to the original National Commission on Marihuana and Drug Abuse 3 years ago. In our opinion these recommendations are even more applicable today.

First, on education: The National Institute of Mental Health, and other responsible mental health agencies, and medical associations should coordinate a large-scale educational effort to inform the public of the serious implications of marihuana use. The press and the networks can aid immensely in this effort. There is at this time enough information to bring equivocation to a halt. The public can learn that marihuana alone causes serious psychological and neurological effects.

In our view, unless the marihuana problem is brought under better control, it is unlikely that we will be able to influence effectively the hard-drug problem and the growing number of individuals who show long lasting and even permanent effects of damage due to marihuana smoking. All schools, particularly elementary schools, should introduce or improve programs of instruction on marihuana to aid preventive efforts. Measures to control the flow of marihuana must be increased.

Regarding research: Further research on the neurological effects of marihuana in humans should be continued, as should psychopharmacological effects on animals and man. Additional clinical studies should be reported.

In view of the seriousness of chronic marihuana cough, respiratory studies should be continued to determine marihuana's effects on other body systems, including circulatory, renal, and digestive, hormonal and reproductive.

There is a need for continuing research on all quantitative and qualitative aspects of the effect of marihuana on the body system.

Psychoanalytic and psychiatric research on the interferences in mental function, education, and development should continue.

Studies on recurrence of marihuana effects should be carried out.

Regarding legalization and issues of public health: We view marihuana to be a public health hazard. We also believe that the Government has a role in protecting public health. Therefore, logically the Government should not legalize marihuana and should continue to prevent the importing, manufacturing, advertising, and sale of all cannabis products.

Many individuals notable in fields other than medicine have advocated legalization of the sale of cannabis. Their opinions are not based on the clinical examination of those who use marihuana, but on hearsay, questionnaires, testimonials, and a misapplication of knowledge. They do a disservice to our young.

Distinguished members of the subcommittee, this completes our formal testimony and we will be happy to entertain questions.

Mr. SOURWINE. Sir, may I ask one or two questions about what you two have just read?

You told of a man with a severe obsessional neurosis who, during or immediately after smoking, while he had marihuana toxicity, showed minimal symptoms of obsessional thinking and compulsive behavior and symptoms which were secondary as to what you called the stereotyped marihuana symptoms.

I am not clear and I think it would be helpful if the record were clear. Of the obsessional neurosis in the stereotyped marihuana symptoms which is preferable if there is any preferable?

Dr. KOLANSKY. Mr. Counsel, may I turn that question over to Dr. Moore since that patient was a patient of Dr. Moore's?

Dr. MOORE. Actually the purpose of mentioning that is that we have so frequently found individuals who would appear for psychiatric evaluation would have the stereotyped group of symptoms that we felt had grown to be so typically marihuana syndrome and after we would encourage the patients to stop smoking and to completely rid themselves of drug use we found that they would develop old neurotic patterns.

I would think that of the two, if you press me as to which would be better, I think it might be better to be neurotic than it would be to have organic brain damage or structural change as a result of chronic marihuana use.

Mr. SOURWINE. Doctor, I did not understand that you testified that this man was not neurotic, but simply that his system were overridden by the marihuana syndrome.

Dr. MOORE. Yes.

Mr. SOURWINE. He was obsessionally neurotic all the time?

Dr. MOORE. That is right.

Mr. SOURWINE. He did have what you might call an apparent remission because it was overriden by the sysmptoms, but it was not a true remission, was it?

Dr. MOORE. No, it was not a true remission, but because of the change in his whole method of operation in life due to the marihuana use, it was no longer obvious to the world nor to himself.

Mr. SOURWINE. Is it fair then to say that marihuana warps and it will warp even a man who is already warped—it superimposes its own warp?

Dr. Moore. Yes, sir, I would say that. I would say it is an organic injury on an already psychological insult.

Mr. Sourwine. Mr. Chairman, I have one or two other questions. Would you prefer that I defer them until——

Senator Gurney. Go right ahead, Mr. Sourwine.

Mr. Sourwine. You told us of slow motion resulting from a combination of an emotional lethargy and slowing of the sense of time. Am I correct in understanding that is a case when slow seemed fast to the subject?

Dr. Kolansky. Often times there is a distortion mentally of the sense of time in the marihuana smoker. Patients, one patient, for example, told me of an experience of beginning to smoke at 4 o'clock one afternoon and he knew that because he had just looked at his watch because a companion had asked him the time, and the next thing he knew, though he said he was not asleep, his watch registered as 9 o'clock in the evening. He thought only a very short period of time had elapsed, and he was startled to find that some 5 hours had elapsed, so that is one aspect of the distortion of time that goes on.

But we were also describing a kind of slow motion movement and thinking and lack of alertness that has perhaps an additional implication which to us has an organic ring in the sense that the individual cannot really, cannot continue to function in a steadily organized and time-related fashion.

Often that individual is not aware of that slowing of effort, of time, of thinking.

Mr. Sourwine. I had a question just on that point to follow this, but to complete this question, did you ever find any instance of a change in the time sense the other way, where marihuana appeared to accelerate the time sense so that to the smoker everything seemed to be very slow or dreamy?

Dr. Moore. I could give a clinical example that would pretty much, from what I have seen, prove the opposite.

A young individual who was driving down one of the expressways had to gradually keep over to the right-hand side because he felt that the traffic was moving faster than he could keep track of mentally. In other words, he felt that the external world was moving more rapidly than he could handle. Finally, he became so anxiety-ridden, so terrified that he pulled over to the side of the road and waited for a period of time until he felt safe enough to pull back out into the flow of traffic, until he could get off of the expressway.

Mr. Sourwine. That is again a slowing of the time-sense.

Dr. Moore. I feel that in one of the things that contributes to the slowing of the time-sense is the inability of the individual to coordinate things as rapidly as he might be able to without the chemical effect.

In other words, as things happen ordinarily, an individual can connect those things and move right along with it.

I think with the chronic use of cannabis something happens. He is not able to hold on to all of the observations and perceptions, synthesize them as rapidly and then act upon them. He has to slow down.

Mr. Sourwine. Well, if a man's time-sense slows and he moves in

what is to him a habitual rate, he will actually be moving to the objective viewer much slower than usual, will he not?

Dr. Moore. Yes.

Mr. Sourwine. And this is what you say happens with the marihuana smoker?

Dr. Moore. Yes.

Mr. Sourwine. It does not actually speed up their time-sense so that they have more time to see what goes on. It is exactly the reverse.

Dr. Moore. But they report the opposite.

Mr. Sourwine. But they think that they are seeing movement, is that right?

Dr. Moore. That is right.

Mr. Sourwine. Now that brings me to the earlier mention that you made of this.

You spoke of the flattening of affect, giving it first an impression of calm and well-being and accompanied by the smoker's own conviction that he had recently developed an emotional maturity and insight. And his conclusion is that his drive and ambition and life goals no longer needed to follow those of the mainstream of society.

Would it be fair to paraphrase that and say that marihuana makes both dropouts and copouts?

Dr. Kolansky. Mr. Counsel, I think that would be correct in many, not all.

Mr. Sourwine. I have just one more question, Mr. Chairman.

I think by implication of the previous answer it has been answered but I would like to ask it for the record. Earlier in your statement you told us of the combination effects of marihuana—that there was an early impairment of judgment, a diminished attention in concentration span and a slowing of the time-sense, difficulty with verbalization and a loss of thought continuity characterized by a flow of speech punctuated by non sequiturs which, if I understand correctly, means punctuated by statements that did not flow one from the other. The man, in other words, was speaking disconnectedly. He was speaking nonsense or perhaps as we say in Washington, "gobbledygook."

Would that be correct?

Dr. Moore. Yes, sir.

Mr. Sourwine. But he did not, if I understand the implications of your testimony correctly, he did not himself realize that he was speaking "gobbledygook," that he was failing to communicate. He thought in his own mind that he was being very fluent and very wise and perhaps even philosophical in his expressions.

Would this be correct?

Dr. Moore. Yes, sir.

Dr. Kolansky. Mr. Counsel, to add a point to that, one of the common things that we hear from patients who have engaged frequently in marihuana parties or in social marihuana smoking is the impression that communication is vastly increased between the group who are smoking. Only after the individuals have been some distance removed from the smoking of marihuana, when they have ceased smoking, do they later report that they feel that their thinking was absolutely incorrect, that, in fact, those parties were many times vacuous and self-centered exercises in speech at times, but not communication.

Mr. SOURWINE. Would this be like a man who has a dream in which he invents something miraculous or makes a world-shaking speech and may actually rise in his slumber half asleep, make notes on it, and in the morning the notes are completely unintelligible?

Dr. KOLANSKY. That is a reasonable analogy.

Mr. SOURWINE. These are people who think they are communicating and think they are achieving a rapport, and the only rapport they actually achieve is the rapport of common confusion.

Dr. KOLANSKY. That is correct.

Mr. SOURWINE. I have no more questions, Mr. Chairman.

Senator GURNEY. Just a few general questions, Dr. Kolansky and Dr. Moore.

It is my understanding from your studies and your testimony that it is your opinion that marihuana is indeed a dangerous drug. Is that correct?

Dr. MOORE. That is correct.

Senator GURNEY. And that the use of it—or the prolonged use of it, certainly—can have dramatic, harmful effects upon an individual, and there certainly is evidence that much of that effect may be permanent damage—is that correct?

Dr. MOORE. That is our opinion.

Senator GURNEY. Another question: in your studies and observations of the use of marihuana, is it your feeling that it is becoming more widespread in its use in our population?

Dr. MOORE. Yes. As a matter of fact, there have been recent comments and reports that are really repeats of things that I heard 3 or 4 years ago and that is that the marihuana epidemic has crested and that now it is beginning to decline. I have not found that to be so in my clinical observations. As a matter of fact, what has been happening in the past year is that there may be, and I say may be, and this with a large question mark, a decline on the college campus, but I have a hunch it is not so much a decline as it is an apathy about reporting as to whether it (marihuana) is in use as much. There certainly is no decline in the large suburban high schools and what has happened most recently or over the past year or 18 months, is that it is beginning to appear in the 6th and 7th grades; in other words, the junior high schools.

Senator GURNEY. And that certainly is a new and recent event as far as you believe?

Dr. MOORE. Well, the last 18 months.

Senator GURNEY. Yes.

Dr. MOORE. That period.

Senator GURNEY. I suppose that is even more dangerous because among that age group I do not suppose they are able to exercise the mature judgment perhaps that a college student can exercise.

Dr. MOORE. Not only that, but it will take away the very tools they will need for adolescent development. It diminishes their perceptions and the ability to utilize those perceptions and to synthesize them into a whole; the ability to develop a character, to make new identifications, is all taken away by the use of marihuana.

In addition to that, he is not getting an education. If he smokes marihuana in the morning at 9 o'clock in the restroom, he is not likely

to be able to absorb very much education the rest of the day, and that is more common than is generally realized in public and by parents and teachers as well. A youngster who smokes in the morning can get through all day at school without ever being detected.

Dr. KOLANSKY. Senator Gurney, on the same point, I would like to add for the record it is our view that marihuana use has really, as Dr. Moore said, not at all disappeared but it has become more a part of the fabric of the school and of society, so that it really is not talked about very much. I don't think marihuana is being used so much in rebellion against society today as it was 6 or 7 years ago, but it is simply being used, and I think one of the problems in this use is the fact that there has been thoroughly inadequate education on a mass public basis. The efforts are really not being made. There are occasional reports here and there, but now there is another phenomenon that should be noted.

There is an increasing mention of alcoholism among our young people, which indeed is there, and we would take the view, a plague on both their houses, both alcohol and marihuana; but the current situation seems to be a pitch toward the drug epidemic is over, marihuana is no longer a problem, we only have the problem of alcoholism. I think this is a tragic error in thinking, and I think the public must be informed that the epidemic has not crested and that it is an epidemic and that here is a vast toxic effect from marihuana in the self.

Senator GURNEY. That really is why I laid the basic premise with these questions because you touched upon the next point I wanted to make, and that is: is it not your opinion that the widespread impression about marihuana, among lay, not medical people or scientists, is indeed that it is not a dangerous drug? Isn't this the widely accepted opinion?

Dr. KOLANSKY. That is correct.

Senator GURNEY. Now then going on from there, I wanted to ask a couple of other questions on that, too, which puzzled me in your paper here. Taking them in chronological order, you mentioned that one of your papers was printed in the American Medical Association Journal and, as I understood it in the very same journal there was an editorial that, if it did not discount your paper entirely, at least refused to mention any of the serious points you made. Isn't that true?

Dr. MOORE. No.

Dr. KOLANSKY. No.

Dr. MOORE. That probably—there were two papers that were published in JAMA, that is the Journal of the American Medical Association.

Senator GURNEY. Yes.

Dr. MOORE. I read part of the editorial that accompanied the second paper.

Senator GURNEY. I see.

Dr. MOORE. Which laid stress on the organic effects. In the first paper we geared our attention toward the effects on the developing adolescent and we were trying to show at that time how it affects adolescent development adversely.

Also, coincidentally, or accidentally—of course, we as psychoanalysts do not believe in accidents—in the same journal there was an article, not by the editors but it was an additional article published by two, I think they were psychologists or Ph. D.'s in New York, on the whole matter of scientific investigation in medicine, in which they stated that you must have in every medical scientific investigation or any scientific investigation a cover group or a double blind study and so forth.

We answered that in our second paper under the title of "Methodology", and we pointed out that in medical clinical investigation, whenever you have a new set of symptoms appearing on the scene that are unlike any other symptoms, and when you have in those individuals who have this new set of symptoms some common factor, element or toxic drug, you then can begin to suspect that perhaps that drug has some cause on the effect. After a period of time, if you remove what you suspect to be the causative factor and the symptomatology disappears and then later on, giving the drug again, the symptomatology reappears, then you can pretty safely assume—and this is common clinical medical practice that has gone on for centuries—you can assume that you have a new clinical entity. It remains after that to be proven in the laboratory and in other specialties of medicine.

We pointed out at that time that this method did not mean that our results were any less scientific nor were they any less valid than the so-called double blind study. As a matter of fact, if we were to write a paper attacking double blind studies, we could tear them apart and show them how they can make plenty of mistakes with such a scientific method. That is probably where the misunderstanding came from. It was not an editorial, it was a coincidental article and, incidentally, it was the news media that picked it up and made the connection.

Senator Gurney. I see.

Dr. Moore. As though they were refuting what we had done, which was not true.

Senator Gurney. I see.

Dr. Kolansky. If I may add, Mr. Chairman, you may also be referring to our quotation from the editorial itself in the second article in the Journal of the American Medical Association which was entitled "Buyer Beware."

If the wording sounded ambivalent in the editorial to begin with, it was anything but ambivalent towards the end of it because the editor said, and I quote once more, "If marihuana ever were given the same legal status as alcoholic beverages nothing could be said except 'Buyer Beware'."

Senator Gurney. Another question on this business of the country not taking marihuana seriously was the report of the National Commission that you referred to here on page 4 and page 5. The National Commission—I forget what the title of it was—on Marihuana, wasn't it, Marihuana and Drug Abuse? Why do you think that they took so lightly this problem of smoking of marihuana as they did—and we all know they did—do you have any idea why?

Dr. Moore. We are just as puzzled today about it as you are, sir.

We do not know why they did it. We were shocked when we saw the first reports that came out through the news media. Governor Shafer, before the television audience, and the repeated front page kind of item that practically gave marihuana sanction—and, of course, on reading the Marihuana Commission report it does no such thing. It actually states in the Marihuana Commission report that they discourage its use, and they certainly did not approve of legalization, and there are parts in the Commission's report that very clearly state that it affects adolescent development, that it should not be used by adolescents, and particularly discouraged use by them. But these parts were hidden. And we felt that where the Commission perhaps lost the day was that they did not, at least, give enough emphasis to the warnings, with the result that the report was highly ambivalent and, in our terms, it means you say one thing out of this side and the opposite out of that side.

You should say them both the same way.

Senator GURNEY. Was there ample scientific and medical evidence presented to the Commission, or available at that time, which showed that the drug was a dangerous drug?

Dr. MOORE. I would hope so.

They had access not only to what we said, but they had access to a number of other individuals in this country who have done work on it. They had access to Campbell's report. They even ignored that report, practically, and that was a very important report.

Campbell even raised the question at that time as to whether the chronic use of hashish might in fact cause an epidemic of Parkinsonism, which Dr. Hall referred to in his study this morning, and Dr. Campbell felt that the effect of cannabis on that area of the brain was, that, if destroyed, it will in later life develop into Parkinsonism. He felt there was a certain correlation between the epidemic proportions of Parkinsonism in Nepal and the chronic use of hashish.

Senator GURNEY. Is it fair to say—and here I must rely upon you because I am not familiar with the media treatment of the Commission's report, I just recall very little about it, but I suspect you probably paid attention to media reports—but how did they present the report, generally speaking, to the public?

Dr. KOLANSKY. Mr. Chairman, if I may take that, and maybe Dr. Moore will comment further, I feel it would be difficult for the media to select out the comments that Dr. Moore just summarized. I noted that last week in the prepared statement by Dr. Brill—who was a member of the Commission—in his statement here, that he indicated that the Commission strongly worded their feeling about the danger of marihuana. But I must submit that I think it would have been very difficult for the media to weed those aspects out.

Moreover, we wrote to the Commission after we had testified, indicating that Campbell's report was now available. We sent a copy of the report to the Commission. We got a rather terse letter back indicating that they were aware of the Campbell work. To our knowledge it was not mentioned. On a Sunday morning——

Mr. MARTIN. May I ask you who sent this report to you, who sent this letter to you, for the Commission?

Dr. KOLANSKY. I don't recall who it was, but it was sent from the Commission.

I might also add that the news media were aware of Campbell's report and reported on it, and, in fact, on a—I think it was a Sunday morning, "Meet the Press' or one of the other major network programs, in which they had a discussion with a member or members of the Commission. The reporters there present themselves brought up the Campbell work, and this was virtually promptly dismissed with the statement, "These people were all on other drugs and, therefore, the meaning of the toxicity of marihuana in the Campbell work is not of significance"—and I am paraphrasing here. But the people in the Campbell work were not all on other drugs. Some were. The one single uniform feature in those young patients who had cerebral atrophy was their smoking of marihuana from 3 to 11 years. So the Commission, in our opinion, did ignore or play down certain findings, to our distress.

Senator GURNEY. Is it fair to say, then, generalizing, of course, that the Marihuana Commission really misled the media in their presentation of the dangerous aspects of the use of marihuana? Is that a fair statement?

Dr. KOLANSKY. More charitably, I would simply indicate that, in the form in which it was written, it was difficult for the media to weed out what was significant.

Senator GURNEY. And as a result of that is it fair to say that the public—or there was an opportunity missed to inform the public of the dangerous aspects of the use of marihuana?

Dr. KOLANSKY. We feel that way.

Dr. MOORE. To at least sound the early warning signal.

Senator GURNEY. And what our problem really is now and, of course, that is why this subcommittee is intensely interested in this, in bringing before it just about every eminent authority it can to present the results of their findings, is because we think the paramount issue now is to present to the public the dangers of the use of marihuana so that they will understand. Perhaps parents and teachers or whoever has charge of influencing and guiding younger people can bring this to their attention.

Don't you think this is something that we all need to do?

Dr. MOORE. Yes, sir, we do.

Senator GURNEY. Thank you, Doctor.

Mr. SOURWINE. May I ask one question following out the Chairman's thought?

Senator GURNEY. Yes.

Mr. SOURWINE. Would you say it is fair to describe what the Commission did as a Solomon-like decision? They had a certain dichotomy among their membership, they wanted to go two ways, so they cut the baby down the middle and gave half to each side.

Dr. MOORE. I would say that is a fair statement.

Mr. SOURWINE. Thank you.

Senator GURNEY. Well, thank you, Doctors, for your testimony. It certainly has been helpful.

Our next witness is Dr. Bejerot. Dr. Bejerot, would you identify yourself for the record?

TESTIMONY OF PROF. NILS BEJEROT, STOCKHOLM, SWEDEN

Dr. BEJEROT. I am Dr. Nils Bejerot from Karolinska Institute, Stockholm.

Senator GURNEY. Let me ask, there was one missing when we began—I believe you were sworn in, Dr. Bejerot.

Let me ask you a few questions, Doctor, about your qualifications.

You took your medical degree from the Karolinska Institute in Stockholm?

Dr. BEJEROT. Yes, in 1957.

Senator GURNEY. And subsequently you trained as a psychiatrist at the Southern Hospital, the St. Goran Hospital in Stockholm from 1957 to 1962?

Dr. BEJEROT. That is right.

Senator GURNEY. And from 1958 up to the present you have served as a consultant psychiatrist to the Stockholm Police?

Dr. BEJEROT. Yes.

Senator GURNEY. And in 1963 you studied epidemiology and medical statistics at the London School of Hygiene, on a grant from the World Health Organization?

Dr. BEJEROT. That is right.

Senator GURNEY. You have been involved in an intensive study of drug dependence for some 8 or 10 years now?

Dr. BEJEROT. Something like that.

Senator GURNEY. You are the author or coauthor of more than 130 scientific papers?

Dr. BEJEROT. Yes.

Senator GURNEY. And you are also the author of several books on drug addiction?

Dr. BEJEROT. Yes.

Senator GURNEY. Is it correct that your best known is "Addiction—An Artificially Induced Drive"?

Dr. BEJEROT. I think that book is the most well known.

Senator GURNEY. How many languages has this been translated into?

Dr. BEJEROT. I think four languages—five.

Senator GURNEY. Is it fair to say that another work of yours, "Addiction and Society," is widely regarded as a standard text, or as the standard text, on the epidemiology of drug abuse?

Dr. BEJEROT. I have been told so.

Senator GURNEY. Well, you are very modest.

Proceed with your statement, Doctor, and if you could make sure you get that microphone so you are talking directly into it.

Dr. BEJEROT. Thank you, Mr. Chairman.

On the request of the Senate Subcommittee on Internal Security, I am presenting here a summary statement of my views on the social and psychological effects of cannabis, and on the specific question of legalizing the sale and use of marihuana.

The most important psychological complication of cannabis abuse is addiction. An excellent illustration of this phenomenon was given by the Egyptian delegate at the Second International Opium Conference (1924), and is reprinted in the committee hearings of Sep-

tember 18, 1972: "Notwithstanding the humiliations and penalties inflicted on addicts in Egypt, they always return to their vice."

It is often declared that cannabis does not give rise to addiction. This is a misunderstanding which has arisen concerning the nature of addiction, and here I refer to my first appendix, "A Theory of Addiction as an Artificially Induced Drive," published in the American Journal of Psychiatry.

The pharmacological and physiological phenomenon of tolerance, that is, the situation where an individual needs to increase his doses in order to obtain the same effects of the drug, and the so-called physical dependence connected with this, has been confused with addiction, which is synonymous with drug dependence or psychological dependence. Tolerance development only represents a temporary adaptation of the body tissues to the drug taken. The distressing vegetative or "physical" abstinence phenomena are experienced only in connection with drugs with a depressant effect on the central nervous system: Opiates, barbiturates, other sedatives and hypnotics, alcohol, solvents, et cetera, but are almost completely absent even in advanced abuse of drugs with a central stimulant effect—cocaine, amphetamines, phenmetraline, methylphenidate and hallucinogens such as mescaline, psilocybin, cannabis, LSD, et cetera.

The physiological or "physical" abstinence reactions are easily handled and cured in a few days or weeks of adequate treatment, and do not give rise to problems of any medical significance. The main effect of the tolerance phenomenon is that it makes it extremely difficult for an addict to break a period of drug taking. To cure drug tolerance or vegetative abstinence reactions is simple, to cure or even handle the addiction is extremely difficult.

Thus, physical dependence is only an incidental metabolic complication of certain kinds of drug taking, and is not included in a strict concept of addiction. All euphorising drugs, however, may give rise to psychological dependence or addiction, and this has, as already mentioned, the character of an artificially induced drive, in many cases far stronger than sexual drives. This theory has recently been supported by the experiments of a German team under Professor Roeder in 1974. They considered that if addiction had the character of an artificially induced drive, this drive or craving must have a special center in the brain. They found this center in the hypothalamus region, and were able to put it out of action by the destruction of about 1 cubic millimeter of the tissue by the stereotactic method, and thereby put an end to the craving for the drug. In human experiments, largely carried out on addicted physician volunteers, sexual potency was affected, and this indirectly also supports the theory of the drive character of drug addiction.

A serious complication of cannabis abuse seems to be chronic psychosis, that is, insanity, a condition which has long been recognized in areas where cannabis abuse is endemic. In the West it is often said that these cases reported as cannabis psychoses are actually schizophrenias. If the Committee has any doubts about the existence of chronic cannabis psychoses, it can initiate a simple investigation to illuminate the question. If the rates of schizophrenia among relatives of verified cases of schizophrenia are compared with those

among relatives of persons with chronic cannabis psychoses, there will be a difference in these two rates if we are dealing with two different conditions. This technique was used by Tatetsu, 1963, in Japan to prove that chronic amphetamine psychoses are of a different nature from schizophrenia.

I will not go into details about acute cannabis intoxication, which is a well-known phenomenon, but a few words should be said on the amotivational syndrome. This is a massive and chronic passivity brought about by prolonged and intensive abuse of cannabis. In these cases there is a basically altered sense of reality, and a tendency to magical thinking. Intellectual deterioration, which may be irreversible, and vagabondism commonly develop.

The amotivational syndrome has been observed very late in the West. This phenomenon in the Middle and Far East was commonly interpreted as an expression of general debility, so called "Eastern" personality, et cetera. If cannabis effects are studied on persons who are already passive—as was the case in the La Guardia report, where persons under study were prisoners and unemployed—passivity may escape notice.

In regard to legal aspects of illicit drugs, I would like to make some general remarks on drug epidemics before going into the special question concerning cannabis.

In Stockholm at the end of the 1940's an epidemic of intravenous abuse of central stimulants arose in a little group of about a dozen intellectuals and bohemians. The number of abusers doubled roughly every 30th month for many years, and in 1965 there were about 4,000 cases in Sweden, but none in the other Scandinavian countries.

At the beginning of 1965 a campaign was waged in the Swedish mass media in favor of liberalizing drug policy regarding nonmedical use of narcotic and dangerous drugs. The arguments were on the same lines as in the present campaign for legalizing cannabis.

Under pressure from this campaign the Swedish Board of Health permitted "by way of an experiment" the prescribing of dangerous drugs, both opiates and amphetamines, to a limited number of addicts for intravenous self-administration.

During the 2 years from spring 1965 to spring 1967, when this prescribing activity took place in Sweden, the so-called legal addicts there were together about 200 persons, had a higher crime rate than they had had during a corresponding period prior to receiving their drugs legally [Lindberg 1969].

The records show that they were in receipt of health insurance and social welfare allowances on a larger scale and for longer periods than before this prescribing began; they were unemployed more than previously, although the situation on the labor market had not deteriorated; they even had a higher mortality rate than a comparable group of addicts who were not receiving drugs legally.

In the summer 1967 every fourth intravenous abuser arrested in Stockholm said he had received drugs during this 2-year period from persons he knew to be legal addicts. Six months after the start of the experiment the addicts were receiving on an average twice the quantities of drugs as at the beginning, and after 2 years they were receiving three times the initial amounts as calculated from the 10,000 prescriptions we have checked these on.

During the 2 years the experiment continued, the rates of abuse among arrestees in Stockholm rose more rapidly than during any other period, particularly among the youngest age group, those of 15 to 19 years of age, where the rates rose from 6 percent injecting in 1965 to 28 percent 2 years later.

The rapid fluctuations in Swedish drug policy along a permissive-restrictive scale during the second half of the 1960's provided something that may be justly described as an experimental situation. I have just completed a 400-page report on the covariation between rates of drug abuse among arrestees in Stockholm during the years 1965–70 and drug policy during this period. Only intravenous drug abuse was studied, as only this form can be objectively and simply observed through needle marks on the arms; but there is no reason to believe that other forms of illicit drug abuse would vary in relation to drug policy in another way than the intravenous form.

Several investigations, for instance a comparison with a casefinding study which was one of the most extensive ever carried out anywhere, showed that the arrestees to a large extent were representative for the population of intravenous abusers known to the various authorities in Stockholm.

The study comparing drug abuse and drug policy showed, that during a liberal and permissive period of drug policy, intravenous abuse accelerated. On a return to a traditional restrictive policy in 1967 the acceleration was checked, and when an extrarestrictive policy was introduced with a police offensive on the drug trade in 1969, the rates of abuse fell in this study.

Even though the Swedish mass media have never admitted their responsibility for the permissive drug policy they launched and drove into effect, they have become very cautious on the drug question. There is no longer any articulate demand for a liberal cannabis policy in the Swedish mass media, although there is a large number of cannabis smokers in the country. The Swedish authorities are now unanimously against any further experiments with legal supplies of dangerous drugs.

The illicit drug problem should be seen in the perspective of the dynamics of the spread of the drugtaking behavior. It is generally agreed nowadays that abuse of the type we are discussing here is a contagious condition spread from an abuser to a novice by direct personal contact. This process is called contagion in medicine, and peer pressure in sociology.

In 1965 I introduced a sociomedical classification of addictions according to their mode of inception into three main types—appendix 2.

THERAPEUTIC ADDICTIONS

These are the rather rare cases which have developed as complications to medical treatment. These cases mainly affect middle aged people; they occur in all countries and at all periods; thus their distribution is rather constant in time and place.

EPIDEMIC ADDICTIONS

These are the type we are discussing today. They usually affect young persons, and vary greatly in time and place. As already men-

tioned they arise through case-to-case spread, and for that reason they may increase almost exponentially for long periods. This has been demonstrated concerning injections of central stimulants in Sweden—Bejerot 1970—heroin in Britain, where the rates doubled every 16th month, 1958–68—Bewley et al. 1968—and the inception of cannabis smoking in five Danish towns, 1965–70—Holstein 1972. Later the rate of increase falls and levels off, and the curves are mathematically of the so-called logistic or s-formed type.

ENDEMIC ADDICTIONS

Here the drug has become accepted in society for pleasure and relaxation. The whole population is then exposed to risk, and large groups of ordinary people become addicted to the drug.

Examples of endemic addictions are cocainism among South American Indians, opium smoking in Old China, cannabis smoking in the Middle East and alcoholism in the Christian part of the world.

In the early stages of a drug epidemic only very deviant persons use the drugs, particularly if they must be obtained illicitly. As the epidemic spreads, more and more normal persons are drawn in, until, eventually, the drugs become socially accepted, and then perfectly average people use them: In fact it may then be deviant to refuse to use them. An endemic drug culture is extremely difficult to eradicate. The cannabis epidemic in America today seems to be perilously near to becoming endemic. Large sections of the mass media, on the basis of pharmacological data they were not in a position to judge, have declared that cannabis is harmless, and a suitable drug for young people. It requires no more than this to explain the explosive increase in cannabis abuse in the Western World today.

The demand for legalizing cannabis has been strongest in those countries which have had the shortest experience and the weakest forms of the drug. Correspondingly, I consider that as a psychiatrist, one's attitude to cannabis becomes more negative the more one sees of its effects.

Those who argue in favor of legalizing cannabis are also bound to consider whether legalization is also to include hashish and the far stronger, concentrated product, cannabis oil. Since tetrahydrocannabinol can now be synthesized, the supporters of legislation should also decide if the synthetic products are to be accepted, or only THC extracted from natural products. Since the potency of THC is comparable to that of LSD, it would be logical to make a decision at the same time as to whether LSD, psilocybin, mescaline, et cetera, should be legalized.

Intensive and frequent abuse of hallucinogenic drugs—mescaline, psilocybin, LSD and cannabis—seems to give rise to profound changes in the sense of reality, and this phenomenon does not appear to pass over when the individual is sober or when he stops taking the drugs. In this way the hallucinogens seem to be more dangerous to the mental functions than other groups of euphorizing drugs.

If cannabis were legalized in the United States, this would probably be an irreversible process not only for this country and this generation, but perhaps for the whole of Western civilization. As far

as I can see another result would be a breakdown of the international control system regarding narcotics and dangerous drugs.

TO SUMMARIZE

There is no doubt that cannabis is an addicting drug, and that persistent and intensive cannabis smoking frequently gives rise to profound phenomena with passivity and change in the sense of reality as the most apparent signs.

Thank you, Mr. Chairman.

Senator GURNEY. Thank you, Doctor.

Mr. MARTIN. I have a few questions I would like to ask Professor Bejerot—and, also, I would want to suggest that you answer the questions as briefly as possible. We are very pressed for time; we are going to have to get through with our next three witnesses in roughly an hour. So to our upcoming witnesses I would like to suggest that you cut your reading version roughly in half. The entire text will be inserted in the record as though you read it, in accordance with the chairman's opening ruling, and that will leave some time for questions and we will be able to wind up by 1 o'clock approximately.

Professor Bejerot, if I understood your statement, you differ with the concept that there is an important difference between "addiction" and what we call "drug dependence" in this country. Do you think this is a false distinction?

Dr. BEJEROT. You see, at first I differentiate very sharply between drug abuse and drug dependence, but drug dependence according to my terminology is synonymous to drug addiction.

I define addiction as an acquired, profound, and persistent fixation to certain strong and pleasurable sensations commonly produced by intake of euphorizing drugs. This fixation leads to a behavior of a compulsive character and much resembling natural drives as sexuality and sometimes replacing them, and I consider also such phenomena as, for instance, gambling and kleptomania are kinds of addiction, so you do not need drugs to produce addiction. And I also mean that sexual perversions, such as for instance, fetishism, seem to be more or less conditions of the same nature.

And I would take the opportunity to add here, that drug addictions occur spontaneously in the animal world under natural conditions.

Mr. MARTIN. Using your definition, Professor, there is no doubt in your mind that cannabis use can, and frequently does lead to addiction?

Dr. BEJEROT. There is no doubt about that.

Mr. MARTIN. It is widely argued, at least, it has been argued by some people, that cannabis does not result in psychotic conditions. But I think it is conceded even by people who have made this statement that where you have borderline cases—people who are weak psychologically—the use of cannabis can push them over the border, over the brink?

Dr. BEJEROT. I think that just the borderline cases are those in very great danger. We have an average of 1.5 percent schizophrenics in every society, and we have a few percent of borderline cases, so in a country of this size there are some millions of people who are in a very high risk for psychosis from marihuana or cannabis.

Mr. MARTIN. So you have some millions of people in this country who, in your opinion, might become completely psychotic personalities?

Dr. BEJEROT. Yes, who would be very susceptible.

Mr. MARTIN. If they were exposed to cannabis?

Mr. SOURWINE. May I ask one question for clarification? You would not wish to be quoted, would you Doctor, to the effect that an individual had no serious danger from the use of cannabis unless he was already a borderline psychotic?

Dr. BEJEROT. I would not say so. You see, it is always a question of dose-response relations. But the personal susceptibility differs very much in different individuals and for some individuals far less doses are needed to result in a psychotic break.

Mr. SOURWINE. Is an ordinary person with no special medical education or experience competent to decide whether he is in danger from cannabis use?

Dr. BEJEROT. No, the individual could not do that himself.

Mr. SOURWINE. No other questions.

Mr. MARTIN. If cannabis does as much harm to the individual as your paper indicates, Professor, if there are hundreds of thousands or millions of young people in our country who are using it on a continuing basis, which we know to be a fact, wouldn't this suggest the possibility that, perhaps a decade or two from now, our society may find itself encumbered with a large population of partial cripples—of workers who have lost some of their functional ability, although they are functional at a lower level, and of partially crippled minds that would still operate, but again at a substantially lower level than they were capable of performing at before they were exposed to cannabis?

Dr. BEJEROT. That is true.

Mr. MARTIN. And wouldn't the same thing also apply to the physical effects of cannabis which were described in yesterdays session by the panel of medical scientists which we brought together from various parts of the United States and other countries?

Dr. BEJEROT. I have been mostly concerned with the psychological and psychiatric and social effects, and the physical effects I haven't studied personally. But I was impressed by the testimony given yesterday.

Mr. MARTIN. I have no further questions, Mr. Chairman.

Senator GURNEY. Thank you, Doctor.

Professor Soueif, would you stand up, please, and hold up your right hand. Do you swear the testimony you are about to give this subcommittee will be the truth, the whole truth, and nothing but the truth, so help you God?

Dr. SOUEIF. I do.

Senator GURNEY. Yours is a fairly short statement, Professor, and I think if you omitted the things in the parenthesis, we could get through all of it fairly rapidly.

Let me first ask you some questions here to establish your qualifications, and I will do this all in one question.

It is my understanding you took your doctor of philosophy from Cairo University in 1954; you did postdoctoral research at the institute of psychiatry, London University, 1955 and 1956; you have

been on the faculty of Cairo University since 1962, first as an associate professor of psychology, and, since 1970, as a full professor; since October 1973 you have been chairman of the department of psychiatry and philosophy at Cairo University; at different times, you have been a guest researcher or guest professor at the institute of psychiatry, London University, the Max Planck Institute of Psychiatry in Munich, and the Lund University in Lund, Sweden; from May 1968 to January 1971 you served in your government as Under Secretary of State for Culture; you are currently a member of the World Health Organization's Panel on Drug Dependence, and a member of the Scientific and Professional Advisory Board of the International Council on Alcohol and Drug Addictions?

During the 1960's you produced a major study of the impact of the hashish epidemic on Egyptian society. This study, as I am told, is recognized as a classic in this field. You are also chairman of the Committee for the Investigation of Cannabis Consumption in Egypt.

Are these statements I have made accurate to describe your background?

TESTIMONY OF PROF. M. I. SOUEIF OF EGYPT

Dr. Soueif. Correct, Mr. Chairman.

If you may allow me for one single remark; I thought I heard you saying that I am now the chairman of the department for psychiatry and philosophy, I think it is psychology and philosophy.

Senator Gurney. Well, it was philosophy here, yes. But it is psychiatry?

Dr. Soueif. Psychology and philosophy, not psychiatry.

Senator Gurney. We will make that correction in the record and we thank you for calling that to my attention. Proceed with your statement.

Dr. Soueif. It is an honor to have been invited to give my scientific opinion before this highly esteemed subcommittee on the subject of cannabis consumption.

My colleagues and I have been working on the subject from October 1957. Starting from 1967, I got in touch with American and European scientists who became interested in the field as cannabis taking was reported to have been gradually spreading in a number of Western societies. I was invited to participate in a number of meetings which were held at the WHO in Geneva and in various other places; for example, Rome, Helsinki, and London, where I had the opportunity to raise and discuss various relevant questions with competent scientists who had done significant work mostly in the area of cannabis and drug research.

In my statement, I will have to bank most of the time on the work I did with my colleagues in Egypt. I will refer, however, whenever possible, to other investigators whose work sheds light on relevant issues.

I

A few points have to be made clear:

a. I did all my work on regular long-term users. Most of the work reported in the literature has been carried out on short-term takers

and the immediate effects of the drug. Some discrepancies between the two sets of findings may, therefore, be expected and could be interpreted in various ways.

b. The main part of my work was done on prison inmates; those may differ in certain respects from ordinary citizens. However, in the absence of data pointing otherwise, the information we obtained might be given more weight than mere hunches or impressions, regarding generalizability.

c. Cultural differences between Egyptian takers and their Western counterparts, for whatever this might imply, should be taken into account.

II

Our findings have been obtained by the use of two methods—Soueif, 1967; 1971:

a. We carefully interviewed big numbers of takers and comparable nontakers on a wide variety of points relevant to cannabis use.

b. We also used objective psychological tests to measure a number of psychological functions considered by various authorities to be of crucial importance for adequate functioning in work situations. Such functions are also treated, in the clinical literature, as significant indices of mental health—R. Payne 1973; A. Yates 1973.

In all cases of interviewing and testing, we based our conclusions on the results of comparisons between users and nonusers.

III

We found that the majority of cannabis takers—78.5 percent—expressed a desire, but inability, to get rid of the habit, and about one-fourth of this discontented majority had made actual though unsuccessful attempts to stop the habit completely. According to their own reports, takers, when deprived of the drug, tend to become quarrelsome, anxious, impulsive, easily upset, and difficult to please—see also Haines and Green 1970. Their productivity deteriorates in quantity and quality. Such changes, combined with what seems to be an overpowering urge to continue taking the drug, constitutes some aspects of what the late Dr. Eddy and others called psychic dependence—Eddy and others 1965.

We also found that cannabis takers far exceeded nontakers as regards attachment to alcohol, coffee, tea, and tobacco—see also Cohen 1972; Goode 1971; Leonard 1969; McGlothlin and others 1970; Whitehead and others 1972—and that they, in fact, did so before taking to cannabis. However, the longer they go on taking the drug and/or the heavier they become as habitués, the more liable to adding opium to their drug menue they turn—Figure 1—Soueif 1971; Nahas 1973. This kind of data, in our opinion, suggests that cannabis taking may be viewed as part of a broad need or urge for any chemical agent that would affect the central nervous system, either by arousal or by inhibition, and that more familiarity with or attachment to cannabis facilitates—not necessarily on a pharmacological basis but could be through some psychosocial mechanisms—proceeding towards harder drugs.

However, cannabis takers did not seem to be significantly below the average for nontakers on certain aspects of moral behavior. When faced with situations implying various kinds and/or degrees of temptation, takers did not appear to behave as more vulnerable than nontakers. They, also, did not see any inherent relationship between their drug habit and criminal tendencies or ways of behavior.

We examined the actual criminal records of a large group of convicted takers and of an almost equally big group of convicted nontakers. Both groups were derived from the same prisons. In comparing the two samples, we took into account all criminal offenses other than those having to do with narcotics. More nontakers—13.5 percent—than takers—5.7 percent—were found to have had criminal records previous to their arrest. We also found that nonusers tended to exceed users regarding the average number of crimes committed by each of those having criminal records—Soueif 1971. On the basis of our data, therefore, cannabis taking is not significantly associated with criminality. This conclusion is in agreement with what several other investigators reported—Nahas 1973.

IV

On the objective tests, we obtained the following results:

a. Takers were definitely slow on tests used for the assessment of speed of very simple motor tasks. Those tests were derived from the world-known battery named USES.

b. They did also poorly on a test measuring speed and accuracy of visual discrimination. This test requires a good deal of concentration of attention.

c. Takers were definitely below the average for their comparable nontakers on tests for hand-eye coordination with and without speed being explicitly emphasized in the instructions. "Trail Making and Bender Gestalt Copy" respectively.

d. We also found that on some tests of immediate memory—Bender Gestalt Recall—especially those requiring some kind of mental reorganization of the test material—"Wechsler's Digit Span Backward"—cannabis takers were very low performers.

e. Cannabis takers tended to overestimate distances of moderate lengths. However, nontakers tended to underestimate such distances.

f. As to time estimation the results are still equivocal. See also Hollister and Tinklenberg 1973; Tinklenberg and others 1972.

V

As to the relative magnitude of intellectual and psychomotor impairment associated with cannabis taking we came recently to the conclusion that such impairment seems to vary in size according to the general level of predrug proficiency: The higher the initial level of proficiency, the bigger the amount of impairment. We could, so far, demonstrate the validity of this conclusion within two contexts as follows—Soueif 1974; 1971:

a. Those with a higher level of education—and/or intelligence—show the largest amount of deterioration, illiterates almost no deterioration, and semiliterates in between.

b. Urbans—being presumably at a higher level of arousal than rurals— show much more impairment than rurals, with semirurals in between.

At present, we are testing the theory along a third dimension, namely, young—minus 25 years—versus old age—40 plus years. The prediction is that young takers would display more impairment than older users. We would, also, expect the same pattern of findings to emerge in the area of creative thinking abilities. But this has to await verification.

Senator GURNEY. Thank you, Doctor.

Mr. Martin.

Mr. MARTIN. Professor Soueif, at yesterday's hearings which you attended, Professor Heath of Tulane University presented evidence of aberrations from the normal brain wave patterns in different segments of the brain. The subjects in most of his experiments were rhesus monkeys, but he has also done his experiment with humans. Among other things, he stated that some portions of the brain appear to be much more affected by marihuana smoking than other portions. Could this tie in with your finding that those with the higher level of education show the largest amount of deterioration, illiterates almost no deterioration, and semi-illiterates in between?

Dr. SOUEIF. I think it does show some sort of agreement or convergence with my results in the sense that in the clinical literature—and I am talking here as a clinical psychologist—we know that patients with brain damage are to be tested on tests of speed of psychomotor performance, and the expectation is usually that they show abnormal slowness. This has been shown to be the case during the last 20 years or more. I can tell offhand some names of the researchers.

Dr. M. B. Shapiro of the Institute of Psychiatry of London, has reported on this fact.

Dr. R. Paine from Canada and J. H. G. Hewlett, who were together at the Institute of Psychiatry, did quite a lot of work in this area, and this has been published and republished again in 1973 and it has not been refuted.

Therefore insofar as the slowness of performance goes, this ties up with the idea of brain damage, which has been described yesterday, here.

I think one can go on again telling the same story about something like visual discrimination and that cannabis takers showed some deterioration or impairment of this function.

The only thing to be pointed out is that I did not mention brain damage because I always prefer to stick, very much, to my area of specialization, as a man who studies behavior as it can be observed from outside, and I leave the rest to my other colleagues in the scientific arena.

Mr. MARTIN. I believe you have used the expression "dependence" or "drug dependence" in describing the attachment of the marihuana smoker to marihuana. But whether you call it addiction or dependence, what it adds up to in either case is that the victim is attached to the drug which has enslaved him in an obsessional manner—to the

point where he finds it virtually impossible to separate himself from it even if he wants to?

Dr. Soueif. Oh, correct, I quite agree. I quite agree, and there is no point here in raising any type of semantic problem on it.

Mr. Martin. There is one more question I would like to ask. I hope you can give us a very brief summary, perhaps in 2 or 3 minutes, of the major findings of your classic study on the total impact of the hashish epidemic on the Egyptian population, or on that portion of the Egyptian population that was involved in long-term use of hashish.

Dr. Soueif. I think you probably know that I have been involved in this work for the last 16 or 17 years with an interruption, to be very correct, of one year during 1965–66.

The impression, the general impression, I can just put forward straightaway, is that, if cannabis taking had not been so endemic in my country, I think at least a big proportion of my cocitizens could have been with a higher level of aspiration and sort of more willingness to fight their life through instead of rather leaning towards something like lethargy. I should think so.

Mr. Martin. Their performance capability as individuals and as members of society would have been much greater had they not been——

Dr. Soueif. Yes, yes. As a matter of fact, I am basing this impression on one simple point. I have already made an estimate, and this was published in 1967, about how many regular takers would be estimated in Egypt, and taking the estimate into consideration, together with the fact that the modal age for using cannabis, again at home, is the age between 20 and 40, which is actually the climax of productivity in a man's life, I guess it is a big sort of catastrophe for a nation to have this large number of young men taking cannabis because it is mainly a male sort of phenomenon at home, not like in the Western societies, females, the very big majority do not come to it. So anyway, with the large number of estimated cannabis takers compared with the number of people at this age group who would be working productively, I think it is really very serious.

Mr. Martin. It would not be inaccurate to describe them as partial cripples who had lost a substantial percentage of their ability to perform, either at the manual level or at the mental level?

Dr. Soueif. To some extent one can put it this way, although I am here a bit impressionistic I should say.

Mr. Martin. I have no more questions, Mr. Chairman.

Senator Gurney. Mr. Sourwine.

Mr. Sourwine. No questions, sir.

[Chart submitted by Dr. Soueif with his testimony:]

FIGURE I. THE RELATIONSHIP BETWEEN OPIUM TAKING AND DURATION OF HASHISH CONSUMPTION.

Senator GURNEY. Thank you, Doctor, very much for your fine contribution.

Our next witness is Dr. Malcolm. Would you identify yourself, Dr. Malcolm, for the record?

TESTIMONY OF DR. ANDREW MALCOLM, TORONTO, CANADA

Dr. MALCOLM. Yes, my name is Andrew Malcolm. I am from Toronto, Canada.

Senator GURNEY. I will run through your qualifications in just one long question, Dr. Malcolm, which you can answer at the end.

As I understand, you graduated in medicine from the University of Toronto in 1951.

You undertook a psychiatric residency at the New York Hospital in Westchester County in 1952.

You were registrar at the Bexley Hospital in London, England, for 2 years from 1954.

You were senior psychiatrist at Rockland State Hospital in New York for 3 years from 1955.

You have a certificate of the Royal College of Physicians—Canada—

and you are a diplomate of the American Board of Psychiatry and Neurology.

You were with the Ontario Addiction Research Foundation in Toronto for 9 years, during which time you studied the problems of alcoholism, narcotics, marihuana and solvent-sniffing.

At present you are a full-time practicing psychiatrist and a member of the Drug Advisory Committee of the Ontario College of Pharmacy.

You are author of three books in the field of drugs which have received wide recognition—"The Pursuit of Intoxication," "The Case Against the Drugged Mind," and "The Tyranny of the Group."

You have also authored some 60 papers.

Are those statements an accurate summary of your background?

Dr. MALCOLM. Yes, pretty accurate.

Senator GURNEY. Proceed with your statement, Doctor.

Dr. MALCOLM. The study of drug affliction of the cannabis type is exceedingly complex. I will restrict myself, however, to three related aspects of this study that have been massively ignored in recent years. I refer to marihuana and suggestibility, marihuana and the amotivational state, and marihuana and the ideological conflict.

1. ACUTE EFFECTS—SUGGESTIBILITY

Concerning the acute effects of THC intoxication much excellent work has been done in the last few years. Virtually nothing, however, has been done to determine the relationship between marihuana and the vulnerability of the intoxicated person to persuasion. But this drug is an illusionogen. In sufficiently high doses it is capable of producing what has been called the altered state of consciousness. Such a state, when it develops, has a number of characteristics which I have described in some detail in my book "The Pursuit of Intoxication." (1) These include an impairment of the ability to test external reality and a tendency to engage in nonlogical thinking. Marked changes in time sense and of body image occur. Emotional responses are altered and sensory perception is typically distorted. The result of these myriad effects is the creation of a person who is fundamentally changed from what he is like in a state of normal waking consciousness. His critical judgment is impaired and his capacity to effect transactions with reality is markedly reduced. As a result we may say with some certainty that such a person would be poorly defended against the influences flowing toward him from the milieu in which he has consumed the drug.

This, of course, is an hypothesis based on much clinical observation; but it is one that should not be lightly dismissed without some attempt at scientific validation.

This theory was first publicly proposed by me at the American Orthopsychiatric Association Annual Meeting in San Francisco in March 1970. In early 1972, when I was still a staff psychiatrist with the Addiction Research Foundation of Ontario, I was developing a research study to determine the relationship between THC intoxication and suggestibility; but I regret to have to report here that that institution dismissed both this theory and its principal investigator

shortly after I issued a public criticism of the Commission of Inquiry into the Non-Medical Use of Drugs. This Commission had advised the Government that the simple possession of marihuana should no longer be regarded as an offense against the Criminal Code of Canada.

Of course a very important part of this theory is that three variables determine the degree to which marihuana can become a factor in the attitudinal reorientation of any given person. There is the personality of the user himself. He may be extremely well defended against the loss of control that is otherwise typical of the altered state of consciousness. However, not all of the people who are exposed to marihuana are mentally and physically healthy, psychologically mature, worldly wise and intelligent. Indeed, many of the people who are most liable to be exposed to this drug are either very young, mentally unwell, or both. Such people, who have already been intrigued by the celebrated critics of every institution of our society might, on achieving the marihuana ASC, be caused to accept uncritically the belief that the society is so irredeemably evil that total withdrawal from it can only be regarded as both necessary and virtuous.

But apart from the personality of the user there is also the potency of the material that is actually consumed. Recent studies have established beyond any doubt that the marihuana effect is dose-related. A high dose of THC given to an unstable person who is inclined to be suggestible in the first place might result in a marked enhancement of his tendency to be easily persuaded. And this would be particularly the case if the third variable, the milieu, was especially powerful. And by the milieu I mean the setting in which the vulnerable person takes the drug and, particularly, the charismatic person who is a part of that milieu and who seems to exemplify the ideal member of the disaffiliated subculture.

It is my opinion that among the many unusual characteristics of marihuana use one of the most important is that its users may be rendered suggestible and that what they consider to be their voluntary espousal of a new system of values may be due, in fact, to influences beyond their conscious control. (2)

2. CHRONIC EFFECTS—THE AMOTIVATIONAL STATE

One exposure to marihuana, even by an immature person in a setting highly conducive to his alienation from the general society, will probably not result in his immediate conversion to an entirely new style of living. For this to happen the person must repeat the cycle many times. He must become a chronic or habitual user of this drug.

As a clinician, I have seen numerous people who presented a most distressing picture that resembled in varying degrees simple schizophrenia, the sociopathic personality, and chronic brain syndrome. That is to say, these people seemed to be lackadaisical, passive, uninterested in the world around them and demonstrably unreliable. They would often be verbally quite facile but the range of their thought and feeling would be very limited, I might even say impoverished. Their attention spans would be short and they would seem interested only in experiencing each moment as it occurred without

reference either to the past or the future. Their thinking would be frequently nonlogical and they would be very fascinated by magical explanations for natural phenomena. Absurdities and incongruities seemed only to amuse them in a peculiarly superficial way. They presented, in short, a nonintoxicated version of what actually happens when a person consumes a sufficient quantity of marihuana to achieve a state of disinhibition, mild euphoria, self-centeredness and some degree of detachment from reality.

Now this clinical picture has been called the amotivational state and I consider it to be of the greatest importance that it be either confirmed or disconfirmed that this condition develops in direct response to the chronic use of marihuana. Most of these patients give me the impression that they have been repeatedly persuaded that the values and behaviors that characterize the inclusive society are entirely lacking in virtue even though they are unable to give an informed argument to support their own rigidly held beliefs. In fact they seem to have been converted, through repeated exposure to the drug and to the milieu in which it is used, to a philosophy of life that has very little survival value in a technologically advanced and liberal democratic society.

3. THE IDEOLOGICAL CONFLICT

But therein lies a very difficult problem. A particular scientific study may report that THC, in sufficient quantity, can bring about hallucinations and marked distortions of perception; but this information will be examined by two groups of people and two entirely opposite interpretations will be offered regarding the significance of these findings. The first group will say that the subjects have been rendered psychotic and that the drug must, accordingly, be called a psychotomimetic. These people will be strongly opposed to the further acculturation of this drug in our society. They will say that its widespread use will injure many individuals and reduce the capacity of the society to maintain itself.

The second group will examine precisely the same findings and conclude that the drug is a thing of inestimable value. It expands the mind. It brings about enlightenment. The drug is, therefore, a mind-manifesting agent, a psychedelic. And if only the whole country could be turned on there would be peace and joy at last. The people in this group are the most vociferous apologists for marihuana.(3)

At a meeting of the Smithsonian Institution in 1972, I was on a panel with Dr. Richard Blum and on that occasion my distinguished American colleague pointed out that his countrymen were seeking quiescence through the use of such drugs as marihuana. He said they were escaping from the complex, competitive, high performance culture which was, in so many ways he said, repulsive. The effect of this statement was, in my opinion, to promote the use of marihuana. It would seem that the law was the real problem. The drug was itself relatively benign and therefore the only humane and civilized thing to do was to strike down the law and let the people enjoy this sweet and quieting drug.

Those who were inclined to emphasize the benignity of marihuana were clearly in the ascendant in the early seventies. Those of us who were inclined to regard the drug as a most deceptive weed, to use Dr. Gabriel Nahas' excellent phrase, were being systematically ignored. This tendency clearly continues but there are now some encouraging indications that the words of caution issued repeatedly by a rather small number of us may not have been entirely in vain. (5)

From a clinical point of view we had observed that the drug hindered maturation and retarded recovery from psychiatric illness. I had most particularly suggested that it appeared to play some part in the creation and diffusion of the alienated subculture. We felt that such a drug must ultimately have a profound and deleterious effect on the complex biochemical processes of the living organism. In very recent years such studies, well designed, well controlled, and making use of quantified and active material have served to confirm, again and again, our earlier clinical impressions. Most recently, the study by Kolodny and Toro in St. Louis is an important case in point. (4) These workers reported that among heavy users of marihuana there was a marked suppression of the production of male hormones. This finding, to an observer of the amotivational state, might well seem to be a biochemical factor serving to reinforce the toxic and psychosocial influences that enhance suggestibility and lead, in time, to the development of that unfortunate state of mind in which the afflicted person seems to be dependent, bored and crucially lacking in energy and motivation.

The ideological conflict will continue, I have no doubt; but eventually it will become apparent to all but the most thoroughly habituated users of cannabis that if this drug expands whatever is contained within the cranium the enlightenment conferred is comparable to what one would expect in a case of hydrocephalus.

That, Mr. Chairman, is my prepared statement. Thank you very much.*

Mr. MARTIN. I would like to ask a few questions of Dr. Malcolm. Yesterday Dr. Kolodny, who testified, mentioned the possibility that the so-called amotivational syndrome to which you referred might be the result of a reduction in male hormones caused by the use of marihuana. Does this make sense to you?

Dr. MALCOLM. Well, I was tremendously interested in the works of Kolodny and Toro which have been published in the New England Journal of Medicine because if indeed there is a 44-percent suppression of testosterone, that would be a biochemical basis for what I have

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observed for some time as a psychosocial phenomenon, that is to say, passivity, withdrawal from interest in general activities.

I would say that the cause of the amotivational state is multifactorial but here is evidence from another quarter supporting that.

Mr. MARTIN. You spoke about the amotivational syndrome as though you feel that it is not a hypothesis or an assumption but a reality which you encounter in the great majority or all of the marihuana users you come across?

Dr. MALCOLM. As a clinician I see it as being extremely important so I really have little doubt myself of the existence of this phenomenon. I have seen it very, very often indeed. It is not really for me hypothetical anymore.

Mr. MARTIN. I understand, Dr. Malcolm, that you had designed a device—I do not know how germane this is to our hearing, but it is fascinating—which is intended to stop an intoxicated driver, no matter what causes his intoxication, from getting into his car and starting it?

Dr. MALCOLM. Well, yes. I was concerned that the breathalyzer did not serve to keep the intoxicated driver from the road today because we deal with multiple drug use, and alcohol may not have been the only thing a man consumed so we needed something else to determine whether it is alcohol, THC or almost anything else, but the fact is he would be intoxicated.

There have been proposals put up elsewhere of an electronic device that might prevent him from starting his car, from turning on the ignition. Well, I invented a very simple——

Mr. MARTIN. This is an electronic device that would require him to perform certain complex functions?

Dr. MALCOLM. Certain complex functions such as the phystester which I understand has been developed by General Motors.

Mr. MARTIN. Presumably he could not perform this while intoxicated?

Dr. MALCOLM. Yes, it is a test of his capacity to show good judgment and good eyesight in that case and coordination and so on.

But I felt what was needed, was actually needed, was a mechanical device very simple, very inexpensive, but still if it were properly designed, one which would screen the greatest number of people that would be so intoxicated as to be dangerous on the road, because 27,000 people are killed every year, in fact, in automobile accidents caused by drunk driving.

This was simply a combination lock, and the man would be required to turn the dial to a number of positions. A simple test could be designed to determine how finely it should be calibrated and how many numbers he would have to touch and only until he had completed this test would he be able to in effect start the ignition of his car. It is a device that is so simple that I think it might indeed reduce a good deal of the carnage on our roads if it were developed for use and tested.[1]

Mr. MARTIN. I hope your device is finally produced, Dr. Malcolm, and introduced into automobiles, and that it reduces the carnage on our roads in the future.

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[1] This device, the Toxicomb, is described in "The Case Against the Drugged Mind," Clarke, Irwin and Co., Toronto.

Coming back to marihuana, is there any evidence to support the assumption that people use marihuana as a social stimulant, and that if they use marihuana they won't use alcohol?

Dr. MALCOLM. There is absolutely no evidence. It is a myth that has been set forth over the last few years that marihuana drives out alcohol wherever its use becomes important. In fact, marihuana is added to alcohol and the person now can be described as a multiple drug user, but both drugs continue to be used and I might say in even greater quantities.

Mr. MARTIN. What this would mean is that many of the drunken drivers who are arrested as drunken drivers are probably drunk on both alcohol and marihuana?

Dr. MALCOLM. There is no doubt in the future we are going to be able to show this is the case. Right now the drunk driver is by definition drunk on alcohol but in fact he may have taken one drink and many other drugs. The breathalyzer would show it is far under .1 milligram percent but he still would not be able to function inside an automobile.

Mr. MARTIN. When you get drunk on alcohol and marihuana, is there a simple arithmetic effect in which one is added to the other, or is it a synergistic effect, a compounding effect?

Dr. MALCOLM. Well, both drugs obviously have a central nervous system depressant effect but there are certain things peculiar to marihuana that would greatly complicate the matter. Judgment is obviously affected and the interpretation of the meaning of various symbols that we ordinarily understand is distorted, too. The effect of adding marihuana to alcohol is not similar to what would happen if you just took more alcohol. There is a distortion of perception and a further impairment of judgment of a rather unusual kind.

Mr. MARTIN. I have a rather big question for which I would like to have a very brief answer. Not much is known in this country about the Canadian Le Dain report, but I believe there are some remarkable similarities between the Le Dain report and the Shafer report in the United States. Could you comment on these briefly, Dr. Malcolm?

Dr. MALCOLM. As you say, that is a difficult thing to say in a word. There are many interesting similarities. Both reports contain a great deal of material that would give the general impression that marihuana was a relatively benign intoxicant and not one that would represent a tremendous public hygiene problem. The Le Dain report in Canada actually proposed that the simple possession of marihuana no longer be considered an offense against the criminal code. A similar recommendation was made by the Americans. That kind of information certainly gives the impression to the people that they need not be unduly concerned about the increasing use of that drug. Nor did they emphasize the fact that there were far more potent varieties of that drug available now and in the future. There was a lenient and permissive attitude to marihuana on both sides of the border. Both Commissions were obviously extremely selective. They did not ask for testimony from a number of people who might have said things of a more cautionary nature. I am very familiar with that activity in Canada. I know of many people who were concerned about marihuana who were not invited to testify, and I know perfectly

well there were many Americans and other people who were not asked to testify here. So there was a kind of bias initially in favor of improving the climate of acceptance of marihuana on the grounds that it was criminalization that represented the real problem and not the possibly deleterious effect of the drug itself on the general population.

I think that would be a brief statement in response.

Mr. Martin. I think you have done remarkably well in the short span of time.

The final question I would like to ask: In your writings—I have two of your books at home—you have been critical of the concept known as "wise personal choice"—that is, leave it to the wisdom of the individual citizen—as a mechanism for the social control of drugs.

Dr. Malcolm. Yes.

Mr. Martin. Would you elaborate on this study briefly?

Apparently you don't feel the decision can be left to the individual?

Dr. Malcolm. No.

The problem here is that a great many people have suggested that the answer to the problem of drugs is to give the people all of the information, all of the facts, and then they will make a wise personal choice on the basis of those facts.

Now this appears to be a most beautiful, civilized, humane, and progressive and advanced kind of thinking; and the only problem with it is that it is totally impractical and naive because not all of the vulnerable people in the general community are able to understand the facts or are inclined to care about all the facts. Indeed education is important, and I am not opposed to this at all, but it is very foolish to think that giving the people all the facts will cause them to make a wise personal choice.

It is necessary to have some external restraint when, indeed, some of the people are incapable of exercising internal restraint. But those people who propose wise personal choice usually are unalterably opposed to any kind of external restraint. It is very foolish because what we need in fact is both of these elements.

Mr. Martin. A combination of education and the law?

Dr. Malcolm. Education and the law, and not one or the other. It is very naive to think that everyone is equally educable or would even be guided by these facts, if they knew them. The problem with alcohol in our society is a perfect example of the disastrous impact of wise personal choice. Indeed there is lots of evidence that alcohol is a drug that causes trouble. It is completely available, and no one is guided by the information received.

Mr. Martin. I have no further questions, Mr. Chairman.

Senator Gurney. Thank you very much, Dr. Malcolm, for your contribution to our symposium here.

Our next and final witness is Dr. Zeidenberg. Would you identify yourself for the record, Doctor?

TESTIMONY OF DR. PHILLIP ZEIDENBERG, COLUMBIA UNIVERSITY

Dr. Zeidenberg. Yes. I am Dr. Phillip Zeidenberg, research associate in psychiatry at Columbia University. I am senior research phychiatrist at New York State Psychiatric Institute.

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Senator GURNEY. I will make one statement here about your qualifications and if it is correct you can answer yes at the end.

I understand you are a graduate in mathematics magna cum laude of Harvard University.

You achieved your medical degree from the College of Physicians and Surgeons, Columbia University, in 1958.

You received your Ph.D. in biochemistry from Columbia University in 1965.

Your special disciplines are clinical psychiatry, research in the clinical and biochemical psychopharmacology of both depression and drug abuse and research in electroconvulsive therapy.

At the present time, in addition to being a research associate at Columbia you are the associate attending psychiatrist at Vanderbilt Clinic, associate psychiatrist at Presbyterian Hospital, chairman of the New York State Psychiatric Institute Radiation Safety Committee, chairman of the Drug Dependence Committee of New York State Psychiatric Institute, and director of the methadone treatment program of this Institute.

You have won several fellowships and awards, including the American Medical Association's Physician Recognition Award in 1969, and you have published 12 papers including a chapter in the medical textbook entitled "Medical Aspects of Drug Abuse" published in 1974.

Is that statement of your qualifications accurate?

Dr. ZEIDENBERG. That book is in print. It is 1974, "Drug Abuse as a Factor" and "Medical Aspects of Drug Abuse" now in the press.

Senator GURNEY. Thank you, Doctor. Now you can proceed with your statement.

Dr. ZEIDENBERG. As I pointed out in my recent article on this subject[1] the pressure for legalization of marihuana without even medical supervision so short a time after the beginnings of understanding of its chemistry, pharmacology, and toxicology is unprecedented in the history of this country. I interpret this eagerness as being in part as backlash to excessively punitive measures carried out against naive and noncriminal individuals, especially young people. I feel other factors are also at work in this, but the brevity of this statement precludes going into this complex issue in greater detail. I will restrict my comments to psychiatric and pharmacological hazards which must be seriously considered before any irreversible legislative steps are taken.

I use the term "irreversible" deliberately, because I wish to emphasize that legalization of use of an agent in society creates a situation in which the agent becomes embedded in the social structure and is virtually impossible to extirpate. One need only look at the situation in regard to alcohol and cigarettes to realize this obvious fact. At the present time, heavy chronic use of marihuana is a relatively minor problem in this country although large numbers experiment with the drug briefly and intermittently. There is no question in my mind that legalization of marihuana will lead to a large population of chronic heavy marihuana users, numbering in the

[1] Psychopharmacological Hazards of Legalizing Marijuana in the U.S. Bulletin, New York State District Branches, American Psychiatric Association 16:2, September 1973. Phillip Zeidenberg, M.D., Ph. D.

millions, just as prevails with alcohol and tobacco. Both of these latter agents exact a terrifying toll in human life, suffering, and expense in this country annually. I think it is probable that heavy marihuana use in our country would create a third at-risk population overlapping only in part with the two previous groups and further add to mortality, morbidity, and public cost. Anyone who doubts that such a population of individuals would develop need only look at the public health figures from nations where use is indigenous. I myself have had the opportunity to carefully scrutinize the situation in one such country.[2]

What are the possible public health consequences of the development of a large population of chronic heavy marihuana smokers in this country? I can only summarize some of them in the brief time available.

CHRONIC SOMATO-TOXIC EFFECTS

Although much publicity has been given to studies indicating marihuana as harmless by certain physiological criteria, it must be emphasized that the number of physiological variables which must be studied is enormous before this agent can be established as safe or at least as safe as other drugs—no drug is perfectly harmless. Recent reports have indicated that this agent may be more dangerous than was first realized. A group of workers at the Reproductive Biology Research Foundation in St. Louis have recently reported depression of plasma testosterone levels after chronic intensive marihuana use. Thirty-five percent of these men showed reduced sperm counts.[3] This ties in with an earlier report of gynecomastia in marihuana users.[4]

Nahas and coworkers at Columbia [5] have demonstrated inhibition of cellular mediated immunity of 51 young chronic marihuana smokers. They postulated that this may be due to direct impairment of DNA synthesis by the agent. On the other hand, the findings of Nahas may be hormonally mediated and thus related to the findings of the St. Louis group. DNA synthesis may be secondarily inhibited by effect of the drug on hormones via the central nervous system. Much more work is needed in this area to clarify this matter.

Since time is limited, I will only mention other possible toxic effects which need consideration.

(a) Chronic marihuana smoking causes bronchitis, diminished lung capacity, and abnormal microscopic changes in lung tissue. In the long run, chronic marihuana smoking may have many of the pulmonary effects of tobacco. Furthermore, in many places where it is used, marihuana is diluted with tobacco, so that legalization of this agent will incidentally promote use of a known harmful agent which the Federal Government is now spending large sums to reduce the use of.

(b) Recent reports on chromosomal damage by marihuana need to be considered and reinvestigated seriously. Although they are in conflict with earlier reports, they come from highly reliable sources and

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[2] Kif in Morocco by Gabriel G. Nahas, M.D., Ph. D., Phillip Zeidenberg, M.D., Ph. D., and Claude LeFebure, M.S., International Journal of the Addictions, in press (1973).
[3] Kolodny, R. C., et al. New England Journal of Medicine 290 :872 (1974).
[4] Harmon, J. and Abapoulios, M. A. New England Journal of Medicine 287 :936 (1972).
[5] Nahas, G. G., et al. Science 183 :419 (1974).

would tend to mesh with the previously mentioned research on hormones and cell-mediated immunity. This area needs to be carefully investigated before final conclusions are drawn.

(c) The issue of possible associations between heavy cannabis use and brain damage or permanent behavioral alteration has become hopelessly confused by a maze of conflicting, poorly controlled, and difficult to interpret reports. No definite conclusions can be drawn at this time but this is a priority research issue. No irreversible legislative steps should be taken until this issue is clarified.

ACUTE AND CHRONIC PSYCHIATRIC AND BEHAVIORAL EFFECTS

There is no doubt that a single dose of tetrahydrocannabinol can cause an acute psychotic reaction in mentally healthy individuals. One of our subjects in a small pilot study with oral delta–9 tetrahydrocannabinol had an acute paranoid break lasting several hours. This young man is of unquestionably sound mental health.

Marihuana use is also associated with longer lasting and even chronic psychoses. Many of these individuals, but not all, are found to have a previous history of serious mental illness. The remaining are often loosely dismissed as prepsychotic or latently psychotic individuals. It must be emphasized that this is an operationally meaningless statement making use of facile psychiatric jargon. It is not of much consolation to an ex prepsychotic, made ex by an hallucinogenic drug like THC who might have otherwise made it to a ripe old age still prepsychotic, a condition operationally indistinguishable from nonpsychotic. It behooves us to investigate this aspect of the drug more scientifically before it is made widely available.

I wanted to add parenthetically here in knowing some of the remarks made previously that the capacity of marihuana, generally acknowledged to exacerbate underlying mental conditions, is something which tends to be dismissed because of prejudices which we have in this country against mental illness as an illness.

Now, to take a physical analogy we know that a great percentage of our population carries within it dormantly the herpes simplex virus and if anyone were to suggest the introduction of an agent which would greatly increase the rate of appearance of active herpes simplex this agent would immediately be stricken from use. But the idea of introducing an agent which activates mental illness is something which does not seem to be so reprehensible to individuals, and this is a part of the general public misunderstanding of the nature of mental illness, in my opinion.

As far as the effect of marihuana on behavior of normal individuals is concerned, there is no doubt that it impairs normal functioning. In our work [6] we have found it to interfere with memory, speech, and pain perception. Numerous other studies, more extensive than ours, and involving other parameters, show that much normal behavior in our society is not possible under the agent. Driver performance, for example, is significantly impaired. Thus extensive

[6] "Effect of Oral Administration of delta–9 THC on Memory, Speech and Perception of Thermal Stimulation," by Phillip Zeidenberg, W. Crawford Clark, Joseph Jaffe, Samuel W. Anderson, Susan Chin, and Sidney Malitz. Comprehensive Psychiatry 14:549 (1973).

marihuana use may bring us an entirely new at-risk population suffering from some of the detriments of both tobacco and alcohol.

In our work, which we did, we verified quantitatively some of the observations made by Drs. Kolansky and Moore earlier today about the flow of speech. We found that marihuana interferes with immediate memory and thereby directly interferes with the flow of speech giving the characteristic marihuana speech which is so well known.

Possibly the issue of greatest importance in the area of behavioral toxicity of marihuana is the question of the amotivational syndrome. This problem is frequently dismissed by those favoring legalization as a syndrome that is brought about by coexisting psychiatric difficulties in those individuals who coincidentally use marihuana, or alternatively, it is written off as something which is brought about by hopeless socioeconomic conditions in backward third world nations. Nevertheless, this syndrome is seen consistently in virtually all studies of chronic users in all countries and there are no reliable ways of measuring the subtle changes in mental state that might cause such a syndrome. This type of apathy and alienation may be brought about by drug-induced changes in capacity for attention, concentration, and motivation for which we have no adequate measures. The history of psychiatry is full of unwarranted assumptions about psychological causation that later proved to be erroneous. If we are contemplating legitimizing this agent, it behooves us to investigate this phenomenon thoroughly with refined psychophysiological techniques.

· And let us not deceive ourselves that this phenomena can't happen here in our socioeconomically advanced society. There have been clinical reports of this syndrome in chronic younger users here. Furthermore, the assumption that withdrawal into chronic cannabis use is a response to socioeconomically deprived conditions not found in this country is unwarranted and shows more pride and arrogance than judgment and intelligence. I have seen personally a society in which de facto legalization of this drug has created a large number of people with the amotivational syndrome. The majority of people in this society, although poor, are hard working, intelligent, highly animated and motivated, and not using marihuana. To regard ourselves as immune to this syndrome is not only potentially destructive to our own society but an affront to our foreign neighbors who have more pragmatic experience with this problem and with whom we have existing treaties to outlaw this drug. Clinical experience is often made light of in this era of controlled scientific studies. I do not wish to minimize the value of scientific work. I merely suggest that a thousand years of clinical wisdom are not to be dismissed by a few preliminary scientific studies.

Finally, I wish to discuss my point of view on the social aspect of this problem. I feel that the President's commission on marihuana and drug abuse was correct in stating that the problem of marihuana is only one problem in the spectrum of drug abuse. Alcoholism, cigarette smoking, and opiate abuse all outrank marihuana in magnitude as public health problems. It has been argued that marihuana is already freely available and that a situation prevails akin to that of prohibition, in which excessively punitive measures are employed

against those using "bootleg" marihuana while others use legal alcohol and tobacco freely. It has been stated that legal marihuana would merely continue to be a minor problem in the United States.

I believe there are dangerous psychological errors in these viewpoints. Each of us has within him a certain capacity to commit antisocial acts, varying with the individual and his circumstances. It will be noted from the Third Report on Marihuana and Health that the use of cannabis in the United States has not increased dramatically, despite ready availability. I believe this is because of the fact of its illegality. Illegality is a cutoff point which separates the vast majority of the population from those with psychopathology sufficiently great to drive them to commit the repeated antisocial acts necessary to use it regularly. I believe that legalization will turn on a "green light" which will enormously increase the number of chronic heavy users, just as it has in every other country where de facto legalization exists. Once this happens, marihuana will become an integral part of our social structure and take on complicated social and symbolic significance as tobacco and alcohol already have. Once this happens, it will be virtually impossible to remove it, and any attempts to remove it will indeed be regarded as prohibition, as was the case with alcohol and, in some instances, tobacco. Before the drug takes on this social and symbolic significance, laws against it are not the equivalent of prohibition. Prohibition, as we understand it in this country, is not prohibition in the literal or restricted sense of the words, but a complex memory extrapolated from the events of the 1920's. As such, it does not apply to marihuana restrictions.

On the other hand, certain realities about marihuana must be faced. It is impossible to cut off the supply of this agent. It will always be readily available and there will always be a subsegment of our population willing to take the risk of experimenting with it. Ultrapunitive measures taken against individuals occasionally using the drug can only lead to the backlash of pressure for legalization. Offenders should be given light, but significant sentences, enough to be a sufficient deterrent to repeated use. Chronic heavy users should be offered psychiatric treatment, not jail. This alternative should be reserved for hardened profiteers and sellers. Our job is to prevent marihuana from becoming an embedded social phenomenon. Eradication by legal measures is a hopeless fantasy. The job of the law is to find the appropriate deterrent so that the marihuana problem is kept as a minor drug-abuse problem without crucifying errant adolescents. On the other hand, legalization will open a Pandora's box which we may not be able to cope with for centuries, or ever.

Senator Gurney. Thank you, Doctor.

Mr. Martin.

Mr. Martin. I have just a few questions for Dr. Zeidenberg. You say on page 8 of your testimony that alcoholism, cigarette smoking, and opiate abuse all outrank marihuana in magnitude as public health problems.

Dr. Zeidenberg. Yes, I am talking in terms of numbers and cost.

Mr. Martin. In terms of numbers of people involved?

Dr. Zeidenberg. Yes, in numbers of people involved.

Mr. Martin. But do they outrank it—marihuana—in terms of the damage it does to the individual involved?

Dr. ZEIDENBERG. Well, I think that marihuana is as capable as alcohol and tobacco of causing damage to the individual.

Mr. MARTIN. From your observations and from your reading would you agree with the estimates that have already been offered that marihuana exposure—regular exposure over a 1- or 2-year period—is capable of inflicting irreversible brain damage?

Dr. ZEIDENBERG. I think there is evidence to point in that direction. However, I think that there is conflicting evidence and I think that is something which needs more work and needs to be clarified. There is, however, the distinct possibility that that may occur.

Mr. MARTIN. If that in fact were established, it would be a substantially more dangerous drug than alcohol or tobacco?

Dr. ZEIDENBERG. Well, alcohol causes brain damage if used chronically.

Mr. MARTIN. Not over a 2-year period?

Dr. ZEIDENBERG. Well, it usually takes longer than that and, of course, tobacco, I wish that somebody would clarify that with regard to tobacco, but I certainly think it is a dangerous drug and it may very well prove to cause brain damage.

Mr. MARTIN. Would it not also be more dangerous—we are talking about potential as well as about the situation that exists today—because of its easy accessibility and because of the ease with which it can be used by very young children? For example, a grade school kid can't take a quart of alcohol and hide it in his pocket and go down into the washroom, before school or at the noon break, and drink it.

Dr. ZEIDENBERG. Right, very much more dangerous, and also more dangerous in the sense it cannot be detected, at least not at the present time, and as was pointed out earlier by one of the previous speakers, a child who needs an education can go into the washroom and smoke a couple of marihuana cigarettes in the morning and not learn a single thing for the rest of the day and nobody is going to know it.

A kid who goes into the bathroom and has a couple of shots of whiskey in the morning certainly is going to be detected after a while and receive some kind of treatment.

Mr. MARTIN. It is one of the "safety factors" built into alcohol use, if you wish to use the expression?

Dr. ZEIDENBERG. So it seems.

Mr. MARTIN. The boy who drinks is intoxicated and staggers and the staggering gives him away—that does not happen with marihuana?

Dr. ZEIDENBERG. Right.

Dr. MARTIN. One more question and then I think I will be through.

You say on page 9 of your testimony that the Third Report on Marihuana and Health—this is from the Secretary of HEW to Congress——

Dr. ZEIDENBERG. Yes.

Mr. MARTIN [continuing]. "Reports that the use of marihuana in the United States has not increased dramatically." I don't know whether you have had occasion, Dr. Zeidenberg, to look at the charts submitted to the subcommittee last week by the Drug Enforcement

Administration, showing a staggering increase over a 5-year basis in the rate of interdictions of marihuana and hashish coming into the United States or targeted at the United States. Marihuana interdictions went up tenfold to 780,000 pounds, hashish went up twenty-five fold over a 5-year period to 55,000 pounds. These were seizures made by Federal agents only—these figures do not reflect seizures at local levels. What this means, in effect, is that our law enforcement authorities probably seized substantially more than a million pounds of marihuana and 70,000 pounds of hashish.

If you want to be very conservative, multiply 7 or 8—some people say 10—and you have an idea of the amount consumed. It comes to 7 or 8 million pounds of marihuana, 600,000 pounds of hashish. These figures certainly do not suggest, would you agree, that the marihuana epidemic is receding or diminishing?

Dr. Zeidenberg. Well, they certainly do not seem to correspond to the report of HEW on marihuana and health which says that the increase has not been dramatic. Those figures are certainly very dramatic.

Mr. Martin. There was also a graph showing a parallel upward curve in the rate of arrests by local and Federal authorities for cannabis offenses—it just went up at an angle of about 60 degrees—so that all the indices appear to conform on this point. And the question is, where do the authors of the Third Report get their estimates?

Dr. Zeidenberg. I do not know. I think you will have to ask them.

Mr. Martin. It is a good point.

The Shafer Commission actually last year in their final report said that in 1972 there had been an 8-percent increase in the rate of cannabis use over 1972. We have no figures for 1973, but if it were 8 percent for 1973 it would still indicate a 16-percent increase over a 2-year period, lower than the other figures suggested but still very significant. It does not suggest a tapering off.

Dr. Zeidenberg. No.

Mr. Martin. So on the basis of any available information from official Government sources, the question arises how could they come to this conclusion?

Dr. Zeidenberg. It is a bit surprising. I must say in my own clinical practice I do not get the subjective feeling that marihuana use is tapering off. I still hear about it, I hear about it more and more from my patients. As a matter of fact, it is becoming taken for granted.

I am afraid that the drug is acculturing, becoming part of the society in spite of the red light of illegality. I hope, for one, that that does not happen, but——

Mr. Martin. You speak about the red light of illegality. Are there any red lights on in our academic community or in our media?

Dr. Zeidenberg. Well, generally, I think, the media tends to, in my own reading of the media I don't think the media tends to emphasize the negative aspect of marihuana. They tend to emphasize what has been spoken of as the harmless effects of the drug.

No, I do not think the media have put out a red light.

Mr. Martin. Has the academic community put out a red light?

Dr. ZEIDENBERG. No, generally speaking, I would not say they have.

Mr. MARTIN. So we have here—Dr. Malcolm has made the point that in order to control this you have to have a combination of an educational program and the law. We have the law, we do not have the educational program today?

Dr. ZEIDENBERG. That is true.

Mr. MARTIN. So our defenses are defective in that sense.

Do you have any further comment you would like to make on the third report of the Secretary of HEW on marihuana to the Congress?

Dr. ZEIDENBERG. Well, I had a number of comments. I don't know that the time allows to comment on this, on so much. Their statement. for example, that the typical marihuana dealer is not a street dealer of such drugs as heroin or cocaine, he is typically himself a user, a middle class, not otherwise involved in criminal activity and his selling is closely correlated with his level of use. I really wonder how they know this, I don't believe it to be true. In my own experience I have seen many people who are very deeply into the business of selling marihuana for a profit. I am afraid there is just two much here for me to comment on in the brief time.

Mr. MARTIN. You are aware of the fact that some of the seizures over the past 18 months have run into the multiton range—12 tons of hashish, 3,700 pounds of hashish, 20 tons of marihuana, 43 tons of marihuana. Someone is operating on a big scale?

Dr. ZEIDENBERG. Yes, I believe that is true. I am not personally acquainted with this. I did read an article in Time magazine some time back about a good deal of criminal activity associated with marihuana importation across the border from Mexico into Arizona, taking place between Phoenix and Tucson. That certainly was not the operation of small-scale operators who were just selling it themselves for fun.

Mr. MARTIN. I believe I have gone beyond my time limit, Mr. Chairman. That concludes my questions.

Senator GURNEY. Gentlemen, I want to thank all of you for coming here today and taking time away from your medical practice and your profession, your research or teaching or whatever your work may be and making this contribution in our effort to find out as much as we can about the effects of marihuana on our population, especially our youth. Certainly not only is it a domestic problem here in the United States, which is constantly growing, but it is a worldwide problem in many other countries as well, and I especially want to thank our foreign visitors, visitors from other nations abroad, for coming such long distances to help us out in our quest for information, too.

Thank you very much.

The subcommittee is adjourned subject to the call of the Chair.

[Whereupon, at 1:05 p.m., the subcommittee adjourned subject to call of the Chair.]

MARIHUANA-HASHISH EPIDEMIC AND ITS IMPACT ON UNITED STATES SECURITY

MONDAY, MAY 20, 1974

U.S. SENATE,
SUBCOMMITTEE TO INVESTIGATE THE
ADMINISTRATION OF THE INTERNAL SECURITY ACT
AND OTHER INTERNAL SECURITY LAWS
OF THE COMMITTEE ON THE JUDICIARY,
Washington, D.C.

The subcommittee met, pursuant to notice, at 2:30 p.m., in room 2228, Dirksen Senate Office Building, Senator Strom Thurmond, presiding.

Also present: David Martin, senior analyst.

Senator THURMOND. The subcommittee will come to order. This is the fourth in a series of hearings by the Senate Subcommittee on Internal Security dealing with the marihuana-hashish epidemic, and its impact on the U.S. security.

Last Thursday the subcommittee took testimony from a panel of seven internationally distinguished medical scientists. On Friday we took the testimony of a similar panel of scientists assembled from many parts of the world. Although I could not attend these hearings because of other pressing Senate duties, except for a few minutes, I had them monitored by my staff. I have been told that the scientific evidence presented at these hearings established beyond any question that marihuana and hashish are very dangerous drugs that do permanent damage to the brain; that there was also evidence presented that there is serious damage to the reproductive system, and danger of genetic damage and mutation.

Today we shall be concluding this series of hearings. Our first witness will be a medical scientist, Dr. Julius Axelrod [1] of NIH, who won the Nobel Prize in 1970; our second witness will be Dr. Conrad Schwarz, a distinguished Canadian psychiatrist from Vancouver; our third witness will be Prof. Hardin Jones of Berkeley, one of this country's most eminent scientists, who is qualified in many different disciplines in the general field of medicine and science. Dr. Jones and Mr. Keith Cowan of Canada, who follows him, will be dealing with the causes contributing to the spread of the cannabis epidemic in our country, and internationally, and what can be done to combat the epidemic.

[1] The testimony of Dr. Julius Axelrod was ordered to be printed with the testimony of other scientists on May 16 and may be found on p. 142.

To save time, will all witnesses rise and be sworn in at the same time, at one time as a group? Would you raise your right hands?

Will the evidence that you give in this hearing be the truth, the whole truth and nothing but the truth, so help you God?

Dr. AXELROD. Yes.

Dr. SCHWARZ. Yes.

Professor JONES. Yes.

Mr. COWAN. Yes.

Senator THURMOND. Have a seat.

Dr. Schwarz we would be pleased to hear from you now. If you would please identify yourself for the record, and state your qualifications.

TESTIMONY OF DR. CONRAD SCHWARZ

Dr. SCHWARZ. I am Conrad J. Schwarz, and I am a graduate in medicine of the University of Glasgow, licensed as a practicing physician in the Province of British Columbia, Canada. I hold a fellowship qualification in psychiatry from the Royal College of Physicians and Surgeons of Canada.

Mr. MARTIN. Could you raise your voice, Dr. Schwarz, or bring the microphone closer to you?

Dr. SCHWARZ. I am a consultant psychiatrist to the Student Health Service and clinical associate professor in the Department of Psychiatry, University of British Columbia. I am chairman of the Drug Habituation Committee of the British Columbia Medical Association, a member of the Methadone Advisory Committee of the Canadian Government Department of National Health and Welfare, and a member of the board of directors of the Narcotic Addiction Foundation of British Columbia.

Senator THURMOND. You may proceed now with your statement, Doctor.

Dr. SCHWARZ. I would like to first of all indicate that as a practicing physician and psychiatrist, my approach is essentially clinical rather than scientific. Thus, rather than seeking to demonstrate isolated cause-and-effect relationships, the process consists of the gradual accumulation of observations from which deductions can be made of value in the diagnosis, treatment, and prevention of illness in human beings.

In the case of cannabis, over the past 6 years, I have made an extensive survey of the literature, examined many users, participated in private, public, and professional lectures and debates, and refined my thoughts in a series of published papers. From this ongoing process, I have formed certain clinical opinions which have been successfully applied in practice and teaching, and which I have found to be corroborated by many other physicians working in their own ways. Of particular interest is the fact that many users of cannabis have agreed with much of this material when it has been brought to their attention and a number of them have discontinued use of cannabis with significant improvement in their health.

Most of the details of my thinking on this subject are contained in the selection of four papers marked (1), (2), (3), and (4), which I have made available to the subcommittee. In addition I have sub-

mitted three appendices marked (A), (B), and (C), which detail the advice given in 2 successive years by overwhelming majorities at the annual meetings of the General Council—governing body—of the Canadian Medical Association when the Canadian public were clearly advised against the nonmedical use of cannabis.

I will try, briefly, to cover those points which merit emphasis in relation to cannabis. In the first place, there is a need to correct some of the prevalent myths about the history of this drug. There is no evidence that cannabis was used for pleasure before about the 10th century A.D., in the Middle East or in India. Some writers appear to have used isolated references in ancient manuscripts to what might, or might not have been cannabis, to give a false sense of ancient respectability to it.

Ever since its use for intoxication was recognized, persistent cautionary statements have been made by close observers of cannabis. It should be emphasized that many of the new observations on the adverse effects of cannabis, which are now beginning to pour into the medical journals, are but modern terminological refinements of observations of clinicians and others in the old literature.

For example, the statement of Ali al-Hariri, the 13th century Moslem religious leader quoted in paper (3), who made the clinical observation that cannabis was retained in the body, and had continuing effects, for up to 40 days. Recent scientific measurements—the work of Dr. Axelrod's group in particular—have so far confirmed the presence of THC and its metabolites for at least 8 days in the human body.

Again, as indicated in paper (3), the major national commission studies of cannabis all contain a considerable amount of cautionary clinical material, the significance of which has been lost to the general public because of media preoccupation with the philosophical, political, and legal discussions in these reports. This statement even applies to the often quoted but apparently seldom read Indian Hemp Drugs Commission Report of 1893–1894.

From the point of view of this physician, the overwhelming mass of evidence leads to the conclusion that the use of cannabis constitutes a significant health hazard. The evidence for this conclusion is detailed in the references in the four papers and in appendix (A) and can be summarized as follows:

(1) Cannabis is a complex plant with many chemical ingredients, the nature and action of which are largely, but are not entirely unknown.

(2) What is known is that pharmacologically, a major active ingredient, THC, and its metabolites, which probably have continuing activity, persist in the body for long periods of time, and likely have continuing psychological and physical effects.

(3) The most commonly used derivatives of cannabis, marihuana and hashish, show varying potency, deterioration with time, and variable effects on humans.

(4) Probably because of the long duration of active cannabis ingredients in the body, regular users, that is, once or twice weekly, show clinical evidence of continuing low-grade intoxication, charac-

terized by memory impairment, mood swings, sleep disturbances, and generally lessened functioning. They also show a variety of physical disorders. Both the psychological and physical symptoms usually, though not always, begin to clear up a week or two after discontinuation of cannabis use, suggesting that a long-acting biochemical process is involved. This very relief of symptoms offers presumptive evidence for the "clinical" impression that cannabis is a causative factor in their production and maintenance.

(5) There is evidence that tolerance and increased dosage need is occurring with regular cannabis users. This is indicated by a switch from the use of marihuana to hashish, which is about 8 to 10 times more potent, and by the huge doses of hashish used, for example, by some American G.I.'s in Germany.

(6) Animal experiments have shown that active cannabis products cross the placental barrier and can be passed in breast milk. There are also animal reports of fetal abnormalities and, more recently, there are reports of chromosome damage in human light and heavy users.

(7) In keeping with reports that marihuana contains about 50 percent more tar and nicotine than heavy tar cigarettes, there are reports of cancerous changes in animals and precancerous changes in the lungs of young human users.

(8) There are reports of changes in nucleic acid synthesis in animal brains, which are thought to have some bearing on the clinical observation of memory impairment in humans, and there is also a report of cerebral atrophy in heavy human users.

(9) Finally, there is the recent report from Dr. G. G. Nahas, of Columbia University, of interference with human immune response mechanisms by cannabis, much in the same way that DDT carries this danger.

The physician, presented with the above list, for which detailed references are available in the attached documents, must conclude cannabis constitutes a significant hazard to the health of the individual. It is my contention that there really never has been, and there is not now, any significant body of medical opinion in favor of the utilization of cannabis. Like every other group, the medical profession has been confused about the philosophical and humanitarian aspects of drug use, and some individual physicians have expressed their idiosyncratic opinions as philosophers, lawyers and politicians on both sides of the drug debate.

I myself have indulged in the same process at times in the past, but have found that when I make philosophical, legal or political pronouncements about cannabis, these only detract from what I have to say as a physician and psychiatrist. Such pronouncements seem only to allow some individuals to categorize me personally as being with them or against them and in either case they turn out and continue comfortably in their own convictions. By exercising my democratic right to keep my vote secret, it is my impression that this encourages people to take a closer look at the evidence rather than judge the person.

However, I consider it important to state clearly my views on the

medical aspect of the marihuana debate. It is my clear opinion, based on the material presented to the subcommittee, that the use of cannabis should be discouraged on the grounds of individual and public health concerns. This is an opinion which is shared by the governments of many countries which have signed the Single Convention of the United Nations, by the recent British, American, and Canadian national commissions, and by the Canadian Medical Association.

Given that goal, which seems to be always still standing there when the marihuana smoke blows away, it is up to the legislators in different countries to decide what part their laws should play in achieving it.

Senator THURMOND. Counsel has some questions.

Mr. MARTIN. Thank you very much for your presentation, Dr. Schwarz. Do you find the cannabis problem increasing in Canada, the way it is here?

Dr. SCHWARZ. Well, we have the feeling that it may be beginning to stabilize a bit in Canada; but it certainly has been increasing very rapidly up until quite recently. It's very difficult to say. Certainly the number of convictions for trafficking has gone up dramatically year by year for the past 4 or 5 years.

Mr. MARTIN. I assume you follow the situation in the United States closely because of your general interest in the problem in Canada?

Dr. SCHWARZ. Yes.

Mr. MARTIN. From what you know of the situation here, and from your personal experience in Canada, do you feel that the Canadian situation is roughly comparable to ours, or are there significant differences?

Dr. SCHWARZ. No, I don't think there are any major differences; I think they are quite comparable.

Mr. MARTIN. I would point out in response to your first answer, Dr. Schwarz, people here are saying it is tapering off, or receding a little bit, but there is contrary evidence, quite contrary; the amount being consumed goes up, and up, and up.

Dr. SCHWARZ. Yes, I think we are having the same difficulty in trying to read the month-to-month situation in Canada.

Mr. MARTIN. Do you feel the press in Canada overstates or accurately describes the dimension of the problem?

Dr. SCHWARZ. I think it still has to be called an epidemic in terms of the rapidity of the spread in the use of cannabis over the past several years.

Mr. MARTIN. And the total number of people involved?

Dr. SCHWARZ. I think so.

Mr. MARTIN. Are cannabis users generally honest; have you found them generally honest in their interviews, informing you of the intensity and duration of their habit, and any symptoms they may have noticed; or do you have any problems getting the truth out of them?

Dr. SCHWARZ. I think they are honest, although I think we probably have some difficulty getting the facts out of them; I think that

is partly because of some effect of cannabis, it being a long-acting substance, its duration in the body is continuing and active.

The problem is not so much their honesty; the problem is their difficulty in remembering. I know in my interview technique, which is a fairly fine instrument in doing the investigation of cannabis users—I could give you a brief excerpt. I usually ask them how long they have been using cannabis: how often they use it. Most of them answer that question with, "Oh, I only use it on social occasions." I then say, "Well, when were the last three occasions you used it?" The answer is usually something like, "Oh, last Saturday night, last Friday night, and sometime earlier in the week, but I can't quite remember."

As we go through the process I usually say to the individual, "Is the use of cannabis affecting you in any way adversely," and the answer always is, "No, everybody knows cannabis doesn't do anything to you." So, I then say, "Well, how has your memory been lately," and the most common answer is something like, "Well, that's a funny thing, Doc, it's not as good as it used to be." And I say, "How has your mood been lately——"

Mr. MARTIN. Your what?

Dr. SCHWARZ [continuing]. "Your mood," and the answer, "The funny thing is, my girlfriend tells me I'm more irritable." "How has your sleep pattern been lately?" "Well, I have difficulty going to sleep at night, and I sleep more during the day."

A number of individuals also describe a continuous feeling of being "spaced out" for 1 day or 2 days after the smoking of marihuana. And this again, I think, is related to the duration of the continuing intoxicant in the body.

Usually by this kind of a process we get an individual to agree that cannabis may be a causative factor in this; and if we get him to that point, I usually suggest to him that he discontinue the marihuana for a couple of weeks on a trial basis. Quite often they come back in and say, "You know, I'm thinking a lot more clearly, I didn't realize I was in that fog before. I'm picking up old interests, getting in touch with old friends I haven't seen for quite some time." And that process of improvement can continue to occur if the cannabis user avoids it.

Mr. MARTIN. There are certain symptoms you believe may be caused by certain drugs but are not sure they may be caused by this drug. You remove this drug, the symptoms disappear. This would be satisfactory proof in the eyes of most doctors, would it not?

Dr. SCHWARZ. Oh, I don't think there is any doubt that there are clinical findings, that is, adequate justification, for advising people not to smoke cannabis.

Mr. MARTIN. You, from your own experience, Dr. Schwarz, feel that the amotivational syndrome referred to by psychiatrists that testified previously is a clinical fact, a demonstrable clinical fact; or is it just a hypothesis which has yet to be demonstrated?

Dr. SCHWARZ. No, I think it is a clinically acceptable diagnosis; not necessarily a personality disorder because the causation of it is still unknown, but it is fairly clear that a number of regular users of cannabis are showing a deterioration of functions. Some people

interpret it as a change of personality, while I personally tend to term it more the persistence of a long-acting substance in the body. But, there is no doubt there is a significant change in regular users of cannabis.

Mr. MARTIN. And this is a very frequent syndrome of drug users?

Dr. SCHWARZ. I think I could elicit symptomatology in any chronic user.

Mr. MARTIN. In your statement you made the point you would rather not express your opinion concerning legalizing marihuana because you feel such a pronouncement might detract from what you had to tell your patients as a physician and psychiatrist.

I respect your position on that point, Dr. Schwarz, but I would like to pose an alternative question on the psychological plane. If the Government tells the young people on the one hand that marihuana is a very damaging drug; and yet on the other hand removes all penalties, even a simple civil fine for the possession and use of marihuana, might that not tend to confuse the young people that you are trying to reach?

Dr. SCHWARZ. Yes, I think it's obviously a double message. You are saying on the one hand, we don't want you to use this, but on the other hand, you can have it in your possession. I think that has certainly caused some confusion among people in Canada because this sort of neutralizing statement did come out, for example, in the Le Dain Commission, which presented a massive volume of material on cannabis which was totally ignored, or largely ignored, by the media because the Le Dain Commission came out with legal, or philosophical, comments which affected the headlines.

So, I think it's certainly confusing to people to be told we don't want you to use it but it's ok to have it in your possession.

Mr. MARTIN. Or it's not so bad that we have to impose a penalty.

Dr. SCHWARZ. Right.

Mr. MARTIN. You referred to a resolution of the 1972 general meeting of the Canadian Medical Association, recommending doctors to advise their patients of the dangers of marihuana.

Dr. SCHWARZ. Yes.

Mr. MARTIN. This was passed by a substantial margin?

Dr. SCHWARZ. There were 220 delegates at the annual meeting of the Canadian Medical Association from all over Canada, representing all physicians in Canada; out of the 220, only two people voted against the resolution advising the Canadian public against the use of cannabis.

Mr. MARTIN. That's a pretty good accomplishment. You must have done a pretty good job of preparatory educational work.

Dr. SCHWARZ. Well, we had not only educational but study work. We had a committee in British Columbia for 4 years looking at cannabis, a committee of seven physicians, all of them with a good deal of experience in the drug field. We were able to present a report to the British Columbia Medical Association that was approved unanimously, and at the annual meeting of the Canadian Medical Association it was passed by an overwhelming vote.

I think not only was the material we prepared, the background,

important in this, but I think it became obvious as the discussion went on in the meeting that many physicians had seen this kind of thing clinically in their offices anyway, and that they had seen something like this happening. We just happened to be able to put it all together at that time in clinical diagnostic terms much better than had been done before.

Mr. MARTIN. Talking about education, Dr. Schwarz, do you believe the young people that use marihuana have a completely closed mind?

Dr. SCHWARZ. No, I don't. One of the reasons why we have to get this kind of information across to the public through the media, it is only when you sit down with the regular cannabis user and start questioning him that he becomes aware of, say, the sleep pattern, his general health; and a fairly significant number respond by agreeing, yes, maybe there is a cause-and-effect relationship here; maybe I should cut down on cannabis use, or give it up completely for a while and see if things clear. Once you get to that point, again, you are much nearer abstention from the drug.

Mr. MARTIN. Mr. Chairman, that ends my questions. I would like to ask, if the chairman approves, that the exhibits and papers which Dr. Schwarz has offered for the record be incorporated in the appendix.

Senator THURMOND. Without objection, that will be done.

Mr. MARTIN. I have one more suggestion I would like to make for the approval of the chairman. Dr. Axelrod's testimony should have been given last Thursday when we had our panel of medical scientists. Unfortunately Dr. Axelrod was not present on that day. I would like to propose that his testimony be printed together with that of the medical scientists who testified last Thursday.

Senator THURMOND. Without objection, that will be done.

I wish to thank you, Dr. Schwarz, for your appearance here and your testimony.

Our next witness will be Prof. Hardin B. Jones. Professor Jones, will you please identify yourself for the record and tell us some of your qualifications.

TESTIMONY OF HARDIN B. JONES, PH. D., PROFESSOR OF MEDICAL PHYSICS, PROFESSOR OF PHYSIOLOGY, ASSISTANT DIRECTOR, DONNER LABORATORY, UNIVERSITY OF CALIFORNIA, BERKELEY

Professor JONES. Mr. Chairman, I am Hardin B. Jones. I am professor of physiology, professor of medical physics, and assistant director of the Donner Laboratory of Medical Physics at the University of California, Berkeley. I have been on the staff of the University of California, Berkeley, since 1938. I received my Ph. D. in physiology in 1944 and in the same year was appointed to the faculty. I have published approximately 100 significant papers on such topics as: origins of cancer, longevity, aging, cardiovascular disease, effects of radiation, effects of smoking and other environmental hazards, physical fitness, nutrition, regional blood flow, infectious disease, and treatment of cancer, and I have recently concentrated my professional attention on the matter of drug abuse. My

fields of scientific specialty include physiology, biochemistry, demography, statistics, biophysics, and epidemiology, and I have used many of these resources in my study of the effects of drugs and the origin of the drug movement. I have recently written a book, "Coleridge, on Coleridge and Opium," and, with my wife, another book, "Sensual Drugs: Dehabilitation and Rehabilitation of the Mind." I tender, as part of my testimony, some of my shorter articles and reports on the effects of cannabis.* One of these is a report to the Army stemming from studies and educational demonstrations I conducted through the arrangements of Maj. Gen. John K. Singlaub, then Deputy Assistant Secretary of Defense, Drug and Alcohol Abuse, a position now held by Maj. Gen. Frank B. Clay. I made three extensive studies of the drug problem in Southeast Asia; the last was with Mrs. Jones (we collaborate) and included studies of our soldiers in Germany. General Abrams, then commanding our forces in Southeast Asia, awarded me a citation for distinguished civilian service in recognition of this work.

It is pertinent to my testimony that I have personally interviewed more than 1,600 drug users, most of whom used cannabis, and that I give a unique course, "Drug Use and Abuse." The course has a current enrollment of 390 students. I have given it 10 times in 5 years, and it provides a clear example of how information, equivalent to that of these hearings, can stop drug abuse.

Senator THURMOND. Dr. Jones, I have a few more questions about your qualifications before you testify here today. I believe it is not an overstatement that you have somewhat of a national reputation for careful scientific research.

Professor JONES. I believe that is true, sir.

Senator THURMOND. It was because of this reputation that you were asked to serve as a consultant on the Atomic Energy Commission on the effects of radiation and protection against radiation; is that true?

Professor JONES. I did most of the basic work that led to the new standard for radiation protection, and guidance to estimate radiation exposure hazards based on proportionality rather than on a threshold.

Senator THURMOND. And it was your research that established the basis for the radiation safety standards currently in use.

Professor JONES. I believe that my research and the evidence submitted played a very large part in that.

Senator THURMOND. These standards are generally accepted by the scientific community, are they not?

Professor JONES. Yes, they are.

Senator THURMOND. It was also your reputation as a careful scientist that led you to the appointment as consultant on the Army Drug Abuse, did it not?

Professor JONES. Yes, it was.

Senator THURMOND. You may proceed now with your statement, Dr. Jones.

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*A list of the articles referred to may be found at the end of Professor Jones testimony, p. 250. The articles are retained in the files of the subcommittee.

Professor JONES. Senator Thurmond, I preface my prepared remarks to thank you and your colleagues of the Internal Security Subcommittee for these hearings. They comprise the most extensive and comprehensive scientific meetings yet held on cannabis abuse. A number of us have made this observation. We also want to state clearly that the subject is urgent and needs the most serious attention. The awful fact is that we are caught up in the most destructive epidemic of cannabis abuse the world has yet known. But the magnitude of the disaster has not been recognized and corrective remedies have not been applied. These hearings may be the first step toward corrective action.

Mr. MARTIN. Before you go further, Professor Jones, I note from your qualifications that you are also experienced as a medical statistician—perhaps you can throw some light on a matter that has been troubling some of us on the subcommittee. On the one hand there are official surveys that tell us that the cannabis epidemic has either leveled off, or perhaps tapered off; on the other hand, there is a massive annual increase in marihuana and hashish seizures, marihuana has gone upward in a 5-year period tenfold to 780,000 pounds; in the case of hashish 25-fold over 5 years to 54,000 pounds—by Federal agents only. And cannabis arrests over the same period of time have increased comparably. All of this suggests that there has in fact been a continuing increase in cannabis abuse, rather than a tapering off. How do you explain such a conflict?

Professor JONES. Well, it depends, Mr. Martin, on what information one uses. In different parts of the country one gets different examples of the extent of drug use, or drug abuse. In the beginning of the epidemic the larger cities and college campuses particularly were the beginning of the infection that led to the epidemic; and these centers for the most part now have reached saturation as far as the numbers or fractions that may be involved.

But, our rural areas, that is a different thing. In our rural areas the epidemic is just now reaching public crisis proportions. And in most rural areas in the United States, areas that we formerly thought were immune, if there is such a thing, the problem is about as bad as it is currently in Berkeley.

But I, myself, believe from all the surveys I have been able to supervise and personally conduct on the university campus—and the large number personally available to me from my own samples at Berkeley amounts to approximately a thousand students a year, a good size sample—that even today at Berkeley, although drug use on the campus has remained at a fixed percentage, 55 percent of the students in the last 2 years——

Mr. MARTIN. 55 percent use what?

Professor JONES. Use cannabis, and some of them of course use other drugs as well.

Mr. MARTIN. Just experimental, or on a regular basis?

Professor JONES. They use it on a regular basis so that even though of the average freshmen coming to the university, only about one in six or one in eight uses cannabis when they come in, each successive year they stay the fraction that uses cannabis or other drugs increases, so by the time they graduate, considerably better than 90 percent are experienced cannabis users.

So, even in the university atmosphere, where the sampling of drugs should show a steady volume, there is still an increase in the students' use of drugs as they pass through the university. This cetainly portends, taking the United States as a whole, that the youngest cohort of the youngsters that are approaching adult age is still being inducted into the drug problem. So, the problem is not going away. I doubt if it is truly even crested as yet, although I would like to think that in the future we may see such evidence.

Mr. MARTIN. One further question, some of the people with whom we discussed the matter tells us that the statistics for seizures or convictions of marihuana and hashish, and the statistics for arrests, year by year, of cannabis offenders, are no reliable indications of the amount of cannabis actually being consumed. Do you feel that these statistics are in fact worthless as indicators of a trend; or do you think that they have serious validity?

Professor JONES. Mr. Martin, I believe the numbers have very significant validity. They are not the only answer, and I think it is always important to go by as many sources of information and points of view as are available. But, in 1968 I wrote a very serious analysis of the trend in the drug problem, and I used arrests of drug users and also seizures of drugs as the basic quantitative information on which to make my projection.

My projection has been accurate within 10 percent in estimating the drug traffic today; and in fact drug traffic today has increased nearly a factor of 10 above the level of that time. So, I think the seizures are very important data. We have always been able to use seizures as some real indication of traffic. In fact, in a country as big as this, with 200 million people involved and the many tons of illicit drugs being seized per year, the statistical stability of these numbers is very great indeed, and you can tell that from the remarkable smoothness of the trend and the uniform rate of increase over the past decade.

Mr. MARTIN. Thank you. Will you proceed with your statement, Professor Jones. And, I want to point out for the information of the two remaining witnesses, you and Mr. Keith Cowan, that we are going to be short of time this afternoon because of the schedule of rollcall votes that are scheduled for after 4 o'clock. So, I would ask you to edit your text as you read it, judiciously, with a view to abbreviating your reading time as much as possible.

Professor JONES. Could the statement be inserted?

Senator THURMOND. Without objection the entire text will be inserted in the record, and you can comment on the main issues if you wish.

Professor JONES. Very well. I will only read those portions that I believe important for us to consider in detail at this time; and I will paraphrase and condense the rest, and try not to go over 20 minutes.

I was talking about the magnitude of the current disaster.

I do want to say that, typical of disasters, the reason they become disasters is that the remedies are a part of the problem and make the disaster worse than otherwise it would be. I feel that most of the public effort that we have applied to the drug problem, in the attempt to convince ourselves that a drug can be kept at a moderate

level, specifically in regard to the cannabis family of drugs, led us to expend most of our energy debating questions as to whether drugs in general, or cannabis in particular, might be legalized or decriminalized; all of this has not only dissipated our energies, but also has kept us from directing our attention to the central problem.

As an expert in human radiation effects, I point out that the chromosome damage found by Professor Stenchever, even in those who use cannabis moderately, is roughly the same type and degree of damage as in persons surviving atom bombing with a heavy level of radiation exposure—approximately 150 roentgens. The implications are the same.

Dr. Heath has presented direct observations in humans that use of cannabis results in persistent poisoning of the deep centers of the brain necessary for the awareness of pleasure. This fits the observations by many of us that marihuana users have severe sensory deprivation, and that this symptom of marihuana intoxication is the slowest and least likely to recover. Dr. Heath has, in a sense, shown by direct measurement that cannabis poisons the very part of the brain that allows full awareness of being alive.

There is perhaps no greater hell, even with pain, than not to be able to feel alive. Those who are not able to feel alive will even seek pain to get relief from their remorse. And that is the hell that is projected for those who use cannabis.

I must say that, with regard to my 1,600 cannabis users, it is rare to find someone that does not show symptoms of this very tragic change. Hopefully those symptoms will be reversible.

Now, in presenting my argument, let me also ask, for the record, that two highly integrated papers of mine will be carried in the record along with this testimony because they have to do with a view of cannabis that is not available elsewhere; and it's highly integrated and coordinated with all the testimony that occurs. These papers, however, are not recent, they were prepared over the last 2 years.

Mr. Martin. May I suggest that this material be accepted for the files of the subcommittee, Mr. Chairman.

Senator Thurmond. Without objection, that will be done.

Professor Jones. Also, for the educative instruction of what we have brought together here, I have three small letters to the public, some of which have been widely distributed already, but they ought to be a part of the record, too, because they will easily allow anyone reading the text to realize the significance of the findings.

Mr. Martin. Do you have any other documents you wish to offer at this time?

Professor Jones. No, I will proceed now to look at the exhibits.

Mr. Martin. May the letters be incorporated as appendices?

Senator Thurmond. Without objection, that will be done.

Professor Jones. The findings of Stenchever and Heath put the effects of cannabis in a very serious category. Not only do we hope that there will be appropriate action by Congress and the executive branch of the Government but we also hope for an end to foolish statements encouraging the use of marihuana.

In my presentation this afternoon, I plan to deal with the sources

of the current marihuana-hashish epidemic, because only when we have identified the sources will we be able to attack and push back the epidemic. A classic source is the influence of the literary-intellectual tradition involving some much admired names in English and French literature. But this by itself would not have been enough to launch the epidemic. Nor did the epidemic arise spontaneously. I believe that the rapidity with which the use of marihuana has spread across our Nation in less than 10 years is the result of a massive and sustained promarihuana propaganda campaign, involving a small but influential number of academic propagandists, the media, the entertainment industry, and the new left.

In my presentation, I plan to deal separately with each of these sources of promarihuana propaganda.

Origins of the Drug Movement

Involvement of literary intellectuals with drugs

Some writers of the late 18th and early 19th century began to make use of mind-altering drugs when the large-scale importation of opium to the Western countries by the East India Co., beginning in 1776, made opium and morphine readily available. The effects of these drugs fitted well with the mood of the Romantic Movement. Under the influence of opiates, writers fantasized and were attactively mystic and incomprehensible. They had much to do with the dreamy impracticality and the sympathy-generating anguish of the Romantic Movement. One cause of the dreaminess was the nonspecific euphoria induced by opium. The anguish, depression, and misery were derived from the special problems of the opium-eater: addiction, tolerance, withdrawal illness, sensory deprivation, and depression. Samuel Taylor Coleridge and Thomas de Quincey were the first prominent writers in this movement; other prominent intellectuals, over the intervening century, were Charles Baudelaire, Edgar Allen Poe, and, in recent times, Aldous Huxley. Huxley wrote an essay, "Heaven and Hell," revealing his drug-induced manic depressive disease. He also wrote, in 1954, the essay that became the touchstone of the current drug movement: "Doors of Perception." Here he witnessed to the mental wonders of "mind expansion" through use of the hallucinogenic drug, peyote or mescaline. Millions have read this romantic and misleading account of mental "trips" on a drug. That hallucinations do occur and are fascinating is not incorrectly reported; what is in error is the assertion that this is "mind expansion" or in any way an enhancement of the powers of perception. The mind simply limps along with portions of the brain not working. Novel? Yes, for normally we do not deliberately generate sensory confusion and impairment of perception. But the romantic notion of "mind expansion" took hold and was combined with supposedly "scientific" studies in the same vein by Dr. Timothy Leary—then assistant professor of psychology at Harvard University. Leary used and studied the drug, psilocybin, which is similar to mescaline but more powerful. The still more powerful lysergic acid diethylamide, LSD, was rediscovered and

used by the drug romanticists in the mid-1960's. In the meantime, through the efforts of Herbert Marcuse, "Eros and Civilization," Timothy Leary, Allen Ginsberg, and others, a political movement based on the use of drugs was conceived and launched.

The political goals of some of the drug cult leaders can be perceived in the almost incoherent ramblings of Leary in his 1968 book, "High Priest." On pages 111–128, he describes a group drug session using the "sacred mushroom" drug, psilocybin, that took place in December 1960.

There were the detached philosophers * * * who knew that the new drugs were reintroducing the platonic-gnostic vision * * * here was Allen Ginsberg, secretary-general of the world's poets, beatniks, anarchists, socialists, free sex love cultists * * *. He was lying on the top of the blanket. His glasses were off and his black eyes, pupils completely dilated—from psilocybin—looked up at me * * *. A little later, in the study. In front of the desk looking like medieval hermits were Allen and Peter both stark naked.

[Ginsberg's words, as cited by Leary, in capitals.]

I WENT IN AMONG THE PSYCHOLOGISTS IN STUDY AND SAW THEY TOO WERE WAITING FOR SOMETHING VAST TO HAPPEN, ONLY IT REQUIRED SOMEONE AND THE MOMENT TO MAKE IT HAPPEN—ACTION, REVOLUTION * * * Allen says he is the Messiah and he's calling Kerouac to start a peace and love movement * * * I also hear Paul Goodman and N. Podhoretz are forming some kind of committee for intelligent action which has as program various things such as sex freedom and drug freedom.

* * * I SAW THE BEST MINDS OF MY GENERATION * * * Allen talked nearsighted Marx-Trotsky-Paine poetry * * * WHO DISTRIBUTED SUPER-COMMUNIST PAMPHLETS IN UNION SQUARE WEEPING AND UNDRESSING * * *. Allen Ginsberg the social-worker politician explaining the sex-drug-freedom-ecstasy movement * * * And so Allen spun out the cosmic campaign. He was to line up influentials and each weekend I would come down to New York and we'd run mushroom—psilocybin—sessions.

In the early 1960's, I was occasionally aware, from student contacts, that the Telegraph Avenue area of Berkeley was experimenting with LSD and free sex—Leary style. But prior to 1965, this must have been confined to a small and isolated segment of the university community.

Chance opportunity to launch the drug movement came to Berkeley in January 1965. The Free Speech Movement won an endorsement from the Berkeley faculty of their contention that free speech includes freedom to engage in illegal advocacies and acts. This sad event occurred on December 8, 1964. When the campus reopened in January 1965, the first such illegal act was open advocacy of drug use—in particular, marihuana and LSD. Pro-marihuana handouts flooded the campus for months, and speakers endlessly sought to promote these drugs in the "free speech area", using university public address equipment, and in classrooms. A student, Charles Artman—"Charlie Brown"—who was much involved in use of LSD and marihuana, became the initiator of the Filthy Speech Movement. When I first met and interviewed him, he was a clean and bright-appearing young man. In a relatively short time, he changed to an aged, sagging, and dull-witted person. As for the few prominent in the Free Speech Movement who have remained active and vigorous, it appears that they were not drug users. On the other hand, there were multiple tragedies among those who used drugs, though no one can prove a causative link to cannabis and LSD.

During this time, we had a son and a daughter on campus. Among their circle of friends, even though our children did not use drugs and the majority of their friends did not, there were nevertheless some who were seriously affected by drug abuse:

1. An A student in engineering became heavily involved with marihuana and LSD and failed in his courses. He partially recovered and changed his major to sociology, but then dropped out into the Haight-Ashbury drug culture and is reported to have died. When last seen, he was unrecognizable physically and with no trace of his former high intelligence.

2. A strong B+ student with aptitude in literature became a "speed-freak"—heavy user of amphetamines. She was also involved with marihuana and other drugs. She has partially recovered—enough to work and support an inactive, pot-using "husband"—but she lost her way.

3. An A student did surprisingly well in spite of his use of cannabis, a few LSD trips, and heroin addiction. But he was able to sustain himself for only a year. Drug use then became his entire life pattern. He left Berkeley, so I do not know what has happened to him since.

4. An A student, son of a professor, became a multiple drug user and a dealer in drugs. He was "busted" early in his drug-peddling career and gained rehabilitation, but only after considerable effort. He is reportedly doing well and free of drug use.

5. An athlete who sometimes dated our daughter had an athletic scholarship, was a strong student academically, and was recognized as an outstanding person. His subsequent involvement with cannabis and LSD produced a permanent personality change. He became homosexual and a dangerous manic depressive. Shortly afterward, in an LSD flashback, he killed a relative. He is now institutionalized.

6. A young man, the son of schoolteachers, very able mentally and with exceptionally fine home training, began using drugs on campus. One day he went home while "high" on amphetamines, beat his father to unconsciousness, and killed his mother by mashing her head with a flowerpot. He never offered any explanation for his "madness."

7. A young man who was both an outstanding athlete and a strong student was accepted into medical school. He was a moderate cannabis user. During his sophomore year in medical school, he died of an overdose of barbiturate self-injected intravenously.

8. An additional six individuals have undergone personality changes due to cannabis and LSD, to a degree requiring psychiatric care. It can be said that, while these six have "recovered", they have certainly blunted their potential and cannot make up for the loss of time in the most formative period of their education and development.

I cite the above cases because they all occurred within the limited circle of friends and acquaintances of my son and daughter. The number of cases is high, in view of the small fraction of that circle that was involved with drugs. No equivalent tragedies occurred among the acquaintances of another daughter, who was at Berkeley in 1960–64, or of our son who is there now, 1970–74, but not in touch

with the drug-using segments of the campus. From questioning parents on this subject, as I often do, I conclude that it is rare today to find adults without some close relative—often their own children—affected by drug abuse; dropping out, indolence, lowering of goals, alienation, and mental dullness are common. Although death from overdose of drugs—heroin, methadone, and barbiturates—has become the leading cause of death of young adults, and although drug use is common, the vast majority of those severely affected remain out of sight, supported by relatives, friends, or state welfare agencies. Superficially, there are few signs that we are suffering such a catastrophic loss. All samplings I have made in ghetto, middle-class, and upper-class communities show extensive harm from cannabis, heroin, amphetamines, LSD, and now cocaine. Yet the magnitude of the problem remains hidden. Families affected bear their anguish in silence, and the agencies that evaluate vital statistics have collected little information on this problem other than numbers of deaths from overdose.

Drug abuse patterns of each type of drug and the techniques of taking the drug spread from person to person. Each user draws in others. This is the explanation of the fact that numbers of drug users increase multiplicatively with time. Prior to 1965, signs of drug use had been increasing at the rate of approximately 6 percent per year. But after drug use was openly advocated, as at Berkeley from January 1965 on, drug use of each type increased at 7 percent per month, resulting in an annual increase 20 times as great as before 1965. Young people became more easily convinced that the invitations offered by drug-using friends were worth accepting. Whereas prior to 1965 it took a decade, on the average, for each user to convert a friend, after 1965 it took only 9 months. The greater susceptibility is, in my opinion, the result of widespread advocacy of drug use by persons in influential positions. Professors—not all, but a few—were involved. Magazines did their part, too, by romanticizing the use of hallucinatory drugs. Life ran feature stories in 1965 of the expeditions to Central America to try the "sacred mushroom", psilocybin. For the first time, the drug abuse disease of a few intellectuals broke into the educational system, literally without opposition and with "distinguished" support for the "mind expansion" hypothesis.

WHAT ARE THE MOTIVES OF THOSE WHO ADVOCATE DRUGS?

I have had discussions with many drug-user advocates. Relying principally on personal experience, they believe that cannabis and whatever else they use is harmless because they perceive no difficulties. That is one of the subtle dangers of most of these drugs: That the user is rendered incapable of detecting the changes in himself.

Some advocates equate drug use with civil rights and with the antiwar movement. After my first lectures about marihuana in 1969, in which I pointed out the adverse effects, a delegation of students called at my office to complain that my lectures were "against their constitutional rights."

From a few of the more sophisticated students involved in the

effort to legalize drugs, I have learned that they expect to start a political movement of the magnitude of the antiprohibition movement of the depression period. An important book in this vein is by John Kaplan, a Stanford law professor: "Marihuana—the New Prohibition."

At Berkeley, where these events began, the Free Speech Movement came first, followed by the drug movement, followed by the Filthy Speech—free sex—Movement, and later by the antiwar movement. There has been a commingling of the same persons in these movements. I have already noted the involvement of the FSM leaders with drugs.

THE DRUG PROPAGANDISTS

Dr. Timothy Leary: I knew him in the 1950's and, in my opinion—reinforced by others who knew him in Berkeley—he has signs of mental deterioration, coincident with his drug use. Typical of the persistent delusions of heavy drug users are his lapses into belief in his personal divinity—note the title of one of his books: "The High Priest." He talked on the Berkeley campus frequently, advocating that students "blow their minds" on drugs. Another Leary phrase was: "Tune in, turn on, and drop out." By chance, I was one of the last to challenge him in public discussion before he was arrested. We debated in San Francisco on Friday, November 7, 1969. Leary asked the audience of some 500 high school journalism students to use drugs to protest the war in Vietnam. "Blow your minds." I replied that many young people had already taken Dr. Leary's advice, and this had led, through LSD use, to the death, or mental or physical maiming, of more people than had been killed or maimed in the war in Vietnam in the same time period. Leary exclaimed, with a waving of his arms: "I've been shot." Then, after a pause, he said: "You are wrong; I know of only 250 who died from taking LSD." I replied: "These were the ones you knew about personally, Dr. Leary." He remained after that in a trancelike state, making no further comment. Interestingly, the newspaper report of the incident cited the "verbal scuffle," but did not give the significant details. Leary's viewpoint is well summed up by his statement, cited by the press on February 7, 1969: "Psychedelic drugs are the most revolutionary agents discovered by man. The Establishment should be having nightmares about them."

Now, the Leary matter is relatively extensive, even in this condensation of my files on Leary; I offer this in its entirety to the committee, but I have also marked certain exhibits that you may find particularly handy. There is no doubt that, in Leary's own words, he and Allen Ginsberg and others were trying to get a drug-sex-ecstasy movement started.

Mr. MARTIN. Mr. Chairman, may these exhibits be accepted with the understanding that the subcommittee will exercise its judgment in deciding which if any of the items should be included in the appendix?

Senator THURMOND. Without objection, that will be done.

Professor JONES. Andrew T. Weil: Then a student at Harvard Medical School, he published [Science *162*: 1234, December 1968],

with Norman Zinberg and Judith Nelsen, a study entitled: "Clinical and Psychological Effects of Marihuana in Man." The authors postulated that there may be a "reverse tolerance" with marihuana use since "people do not become high on their first exposure to marihuana even if they smoke it correctly * * * as use becomes more frequent, the amount of drug required to produce intoxication decreases—a unique example of 'reverse tolerance.'" Although the authors acknowledged the possibility of other explanations for the effect, the colorful phrase, "reverse tolerance," was seized upon by Time in its report on this study.

I replied at once to that extravagant claim:

Time speculates about a "reverse tolerance" to marihuana (Dec. 20). No claims for reverse tolerance have been made by responsible persons, even though the lack of response to marihuana in initial trials is well known. I prefer the statement of a pot user, published by the columnist, Helen Bottel, in April: "Marihuana, contrary to narcotic drugs, has a cumulative effect, and each time it is smoked it will take less and less to feel high, but it may take as many as four or five tries before you get off the ground."

My search into the matter has convinced me that the explanation is not that kids are too scared to let the drug take effect at first or that the pot reaction is the result of suggestion and conditioning or a reverse tolerance. There is no precedent for a reverse tolerance. There is much precedent for accumulation of chemical burdens, and it seems to me that this is the most likely explanation—a lasting and accumulative effect of marihuana on the brain.

I have here as an exhibit my immediate reply to this, which was also published in Time Magazine 2 weeks later, in which I showed what has been borne out today, that this evidence shows that marihuana has a cumulative effect, not a reverse tolerance.

Mr. Martin. Is ask that this be received for the files of the subcommittee, Mr. Chairman.

Senator Thurmond. Without objection, this will be done.

Professor Jones. Nonetheless, the world of literary intellectuals has clung to the term "reverse tolerance", and one can use the presence of this phrase at the present time as a device to tell the difference between papers that are scientifically and professionally sound, and papers and articles on the cannabis problem that are propaganda and fiction; they divide very equally on this point. And none of the propaganda for marihuana that I have ever known since the formulation of this term has left out the term "reverse tolerance", which is unfortunately also included in the Shafer Report, which I consider more a political and sociological document, and mistaken ideology——

Mr. Martin. Let me interrupt you at this point, Dr. Jones.

Professor Jones. Yes.

Mr. Martin. You used the word "propaganda"; are you using propaganda in a derogatory sense? After all, if you believe in something that you believe is good, is there something wrong in making propaganda for it, making the facts known to other people, persuading them?

Professor Jones. That is a point that well can stand clarification. All of us who are here are propagandists because that is the primary explanation given in the dictionary. I have many causes and beliefs that I adhere to and I express myself clearly on them.

However, I am using propaganda in the sense of persons' using an incomplete rendition of the information available and known to them, and probably being intentionally deceptive in their presentation; the dictionary also covers that possibility.

Mr. MARTIN. What you are saying in effect, you don't object to propaganda, you object to propaganda in a bad cause.

Professor JONES. Well, I object to propaganda——

Mr. MARTIN. You object to it in a bad cause.

Professor JONES. I object to a bad cause, certainly.

Mr. MARTIN. And dishonest methods.

Professor JONES. I also object, as a scientist, to dishonest methods. I object as a scientist in a field that has been defined as a problem, and when we are going about deciding the nature of the problem, and its possible resolution, I would fault myself if I didn't give all the possible points of view that need consideration. I would consider as scientific propagandists, rather than scientists, those who simply give a single point of view and eliminate the alternate possibilities that are strictly within the realm of reason.

And I believe that has been done repeatedly with the term "reverse tolerance", and I think its inclusion in the Shafer Commission report along with a lot of other material that was incorporated in a highly uncritical and unfounded fashion places the report, at least partly, in that category. There are other aspects of the report that are not in discussion.

I come now to the case of Dr. Lester Grinspoon of Harvard University. Dr. Grinspoon cleverly omits references to any evidence that marihuana may have more than a transitory effect lasting a few hours. He spoofs selected examples of dramatic adverse effect so as to equate them with error, in order to eliminate adverse evidence. His book, "Marihuana Reconsidered," Harvard University Press, 1971, has been heralded in the New York Times Book Review as "The Best Dope on Pot So Far." The Washington Post, May 30, 1971, in its review by Edward Edelson of Grinspoon's book, had this to say:

"[Grinspoon] is convinced that future experiments will confirm the belief that marihuana is an extraordinarily harmless drug. Here he may be optimistic * * * use of marihuana is increasing. Time and numbers are on the side of legalization. Dr. Grinspoon's book is part of this movement." The book followed his article, "Marihuana," in Scientific American, December 1969. The content of the article led the editor to summarize: "There is considerable evidence that the drug is a comparatively mild intoxicant. Its current notoriety raises interesting questions about the motivation of those who use it and those who seek to punish them." Both works show the same bias. I notice in reviewing my files that I marked his Scientific American publication: "This article is nothing more than promarihuana propaganda." That was in 1969. The intervening years have shown that judgment to be correct. Any competent scientist reviewing the medical literature on effects of cannabis would have raised a number of serious questions pointing strongly against the conclusion that this is an innocuous weed. To paraphrase the Scientific American Summary: "The current notoriety of adverse findings about the use of marihuana, being consistent with the older medical literature, raises interesting questions about the motivation of professors at distinguished universities (Harvard, Stanford, and Berkeley) who claim safety in its use. Do they use it?"

But the propaganda is not entirely the work of these mistaken persons. I accepted an invitation for a television debate with Lester

Grinspoon to be held in Dallas in May 1971. We were to argue the issues for 3 hours; then the station would edit the tapes so as to produce a punchy hour-long program to be used nationally. I was familiar with Grinspoon's arguments, and I was certain that I bested him on each of them. Fortunately, I took the trouble to return to Dallas about a week later for the first televised showing of the edited tape in Texas. There I appeared, apparently agreeing with every outrageous point Grinspoon made! I quickly reached the local station manager and voiced my complaint. The manager reviewed the original tape and gave me an equal hour of prime time the following evening. The edited tape was never again used—at least to my knowledge. Obviously, the editor had liked what Grinspoon said.

Now I come to the case of Dr. Norman E. Zinberg: He is an assistant clinical professor of psychiatry at Harvard University. On my arrival in Boston on April 15, 1970, I read a front-page story in the Globe: "Study Shows Pot Non-Progressive." It reported on a press conference called by Dr. Zinberg to publicize a study by him and Andrew Weil just published in the British scientific journal, "Nature," under the title: "A Comparison of Marihuana Users and Non-Users." It was reported that they had completed a 2-year follow-up of 61 marihuana users, ranging from chronic to brand-new users, and had found absolutely no progression to harder drugs during that interval.

The facts revealed in his paper, however, are as follows: He had interviewed 62 prospective subjects regarding their personal histories and attitudes and accepted 61 of them. The 24 in the category of marihuana-naive were selected as "inhalers" of tobacco cigarettes. The remaining 37 were marihuana users: 9 "chronic" daily users, 28 less than daily use. The study was an experiment with respect to those who had never used marihuana before; but all of the "comparison" on which the report focuses was a retrospective study based on interviews with the subjects, rather than a followup. The naive subjects used marihuana only under Dr. Zinberg's supervision and had not previously tried marihuana or any of the harder drugs, except that two had used amphetamines occasionally to prevent sleepiness. The text states:

> Of the NN subjects [non-naive marihuana users], one had tried marihuana once, seven had taken it "a few times"; the rest used it regularly—weekly or even daily. Fifteen . . . had tried hashish, and four had used LSD (2 once, 1 twice, and one 6 times). All the C group [chronic users] had tried hashish; four of them had taken LSD. One subject had taken LSD twice, mescaline twice, and methedrine, cocaine, and heroin once each. Another had taken LSD three times and heroin once. Both of these had been overseas in unusual circumstances when they had tried heroin several years before the interview, and neither had tried it again. All regular users [of marihuana] . . . said they had ready access to a variety of psychoactive drugs.

In a letter to the Globe, I pointed out that Zinberg's data confirmed my own findings that use of marihuana led young people to try harder drugs. I also commented on the fact that this was not a 2-year follow-up. Zinberg's letter of reply glosses over these important points and insists:

> One of the conclusions of this in-depth study of 63 subjects was that there was remarkably little use of drugs other than marihuana by the participants despite heavy marihuana use by many of them.

The key point, however, is that 24 of the 29 regular users of marihuana had tried hashish, eight of the 29 had tried LSD, two had tried heroin, and one had tried several other drugs, whereas none of the 24 nonusers had tried any of these drugs. Only marihuana users learn to experiment with harder drugs, and some of them become addicted to them.

I have the letter here, in the Boston Globe. There was no doubt in my mind, and there can be no doubt, the evidence is here, I submit it for the record as well as my text of what this report, this man's study shows.

Mr. MARTIN. May they be accepted as exhibits and printed in the appendix, Mr. Chairman?

Senator THURMOND. Without objection, that will be done.

Professor JONES. There are various deficiencies in the Zinberg study, such as the fact that the method of selecting subjects precluded the possibility of having addicts in the study population; but it would be inappropriate to expand the analysis here. The myth of nonprogression from marihuana to more powerful drugs, as generated in this article and the accompanying press conference, has stayed in the promarihuana literature. Like "reverse tolerance", citation of this study in defense of marihuana is an indicator of pseudoscientific treatment of the topic of drug abuse.

In spite of my public disclosure of the falsity of Professor Zinberg's conclusion, he appeared a few weeks later as a guest on a nationwide TV program and gave the same presentation, claiming proof that marihuana users do not progress to other drugs. I complained to the network by telephone and letter, but there was no correction of this propaganda.

Then there is John Kaplan. His book, "Marihuana—The New Prohibition," is a persuasive argument that those wishing to use cannabis should be allowed to use it as they wish, as is the case with alcohol. It is a libertarian and legal argument without scientific competence. The author selects evidence on only one side of the issue, citing a variety of writings that marihuana is a mild drug, essentially harmless. Although the legal argument is well put, it cannot overcome the real evidence that cannabis users are mentally dulled persistently and without capacity for knowing the difference. A legal scholar such as a Stanford University professor of law should have made a more thorough search for competent sources. He is shown to be a propagandist by the bias of his book.

In a special class is Edward M. Brecher, principal author of "Licit and Illicit Drugs," the Consumers Union report on narcotics, stimulants, depressants, inhalants, hallucinogens, and marihuana—including caffeine, nicotine, and alcohol.

Brecher has assembled much interesting material, and it is a compendium worth having, but only if one sets aside most of his arguments and conclusions. They simply reflect the marihuana-is-harmless view. In substantiating this point, Brecher has simply used the promarihuana literature and omitted reference to authorities showing adverse effects. The hasty publication of the Consumers Union report without inclusion of major scientific works on the subject and without critical review by competent authorities has yet to be

explained by the Consumers Union. Its publication has helped in the movement to legalize marihuana.

Dr. Joel Fort of San Francisco has been another tireless worker for the legalization of marihuana. He states that he is against drugs and that marihuana should not be used. Yet, other acts and arguments presented by him have the opposite impact. I have opposed him in debate many times. Occasionally, depending on the kind of audience, he has stated that marihuana is harmless. Mostly, he draws a picture of a world so bad that use of marihuana is a welcome relief, as the lesser of two evils. In his teaching on the Berkeley campus—lecturer, School of Criminology—students report that he asserts that marihuana is less harmful than alcohol and cigarettes. Followers of Dr. Fort, on more than one occasion, have tried to disrupt my class on drugs, as illustrated in the attached articles from the Daily Californian, the daily paper of the Berkeley campus, and from the Berkeley Daily Gazette.

Persons associated with the campaign to legalize marihuana have continued to harass my teaching activities. On the opening day of this quarter—April 1, 1974—in my course on drug use and abuse, offensive leaflets attacking me as a person were distributed to the class of approximately 400 students. The source of the leaflet is not identified but it was rumored to be from the California Marihuana initiative group. Apparently this was part of a plan in which my class had been chosen as a target in order to gain public attention in the campaign for an initiative to legalize marihuana; but the initiative had just then failed to get enough petition signatures to be on the June ballot. The supporters nevertheless "gave me the treatment."

Samuel Irwin is a professor of psychopharmacology at the University of Oregon Medical School. An example of his marked bias toward the belief that the use of marihuana is safe is contained in a pamphlet: "Drugs of Abuse: An Introduction to Their Actions and Potential Hazards". The bulk of this pamphlet is a flawless discussion of effects and hazards of drugs. Irwin fails, however, to give any significant warning about the considerable hazard from use of USD–25 or cannabis. The remarks in the section, "A Look to the Future", are especially disturbing:

> Drugs have positive short-term uses for recreation, for an unique experience, to enhance performance, to produce a change to some desired state, for controlling feelings of anger or distress (to promote well-being), or as important tools in learning some of what it is humanly possible to achieve in awareness, relationships and spiritual growth (more-being, as with LSD and marihuana). But the real challenge of personal development is to learn to go it alone without drugs to achieve a higher, lasting level of spiritual growth, self-actualization and control; it is possible in no other way. This is certainly an encouragement to experiment with drugs, in spite of the exhortation to "learn to go it alone without drugs".

PROPAGANDA FOR MARIHUANA FROM THE "RIGHT"

On many occasions of debate with those advocating the legalization of marihuana, I have listened to such statements as "even the conservative experts appointed by President Nixon on the Marihuana [Shafer] Commission agree that it is a mild drug and should

be legalized." Fortunately, the foolish portions of the Shafer Commission's report were too ambiguous to be convincing.

The turnabout of William F. Buckley, Jr. in reporting (December 1972) that he had used marihuana, found it harmless, and advises decriminalization, is a different matter. His unambiguous statement, his stature as a leader, and the reversal of his former position had a widespread impact. I contacted Mr. Buckley by telephone and letter and was led to believe that he had invited me to reply in a statement to his paper, the National Review. My essay was sent at once (December 14, 1972) but was never published, nor did Mr. Buckley provide an explanation for withdrawal of his invitation.

OTHER PROPAGANDISTS

The above listing of propagandists is by no means complete, even with regard to the major figures. There are prestigious persons other than Bill Buckley who have given occasional aid to the marihuana movement; the list includes Dr. Margaret Mead and Dr. Roger O. Egeberg. They have been silent recently; perhaps the growing body of evidence against the safe use of cannabis has caused them to sense their error. If that is so, I urge them to speak up and redirect those who were misled by their earlier statements. I cannot attempt to provide a list of such persons; it would be very long. But the situation is clear; many have spoken in defense of marihuana without valid justification.

PROPAGANDA FOR MARIHUANA IN THE EDUCATIONAL SYSTEM

All about me in the educational world I observe examples of bias in favor of drugs. My many public letters on the subject of effects of marihuana have drawn answers from a few members of university faculties who hold that the use of marihuana is beneficial. Since these persons claim that they teach about drugs, I presume that they advocate the use of marihuana. In one instance I can be certain that this was the case. The facts cited pertain to a large course, Sociology 1, given in the Winter Quarter, 1973, at Berkeley. I have the statement of a student who gave me the study assignment sheet and the text of the assignment. The text is Targets for Change: Perspectives on an Active Sociology, edited by Bateman and Petersen, Xerox College Publishing, Lexington, Mass./Toronto, 1971. All of the chapters in this book reflect the New-Left varieties of social change, but the example of assigned reading is Chapter 5. Becoming a Marihuana User, by Howard S. Becker. Of all the promarihuana articles I have read, this is the most likely to induce the naive person to try the experience and to convince the occasional user that he has set himself on a path toward ever-unfolding pleasure. The chapter contained no information of any other point of view.

The point I wish to make is that all the students in the class were required to read the most persuasive argument that I have ever known for the use of marihuana. I think that reading it would be the biggest bait that a person who had not yet used marihuana might have, as his required reading. And anybody who is already a mari-

huana user would read it and be certain that he has been lucky enough to start out on the new road to the future.

This kind of instruction does not occur in all college classes in sociology, but it is a very common thing, taking the larger universities in the United States, and many other college campuses.

Mr. MARTIN. May these documents be accepted, Mr. Chairman, for the record, with the understanding that the subcommittee will exercise its discretion in deciding which of these documents if any to incorporate in the appendix as exhibits?

Senator THURMOND. Without objection, that will be done.

Professor JONES. Also, at Berkeley, several other courses consider drug use. Dr. Joel Fort gives such a course, and the others are also in the hands of persons who believe in the moderate use of drugs to enrich life or for recreation. Perhaps most students are not fooled, however, since my class on drug abuse draws many more students. The more subtle propaganda for drugs is that which appears as an element of courses in psychology or sociology or anthropology in which the advocacy of the marihuana experience is a secondary part of instruction. Such examples appear to be common.

MISINFORMATION STEMMING FROM OFFICIAL GOVERNMENT REPORTS

The Federal Government, through its official commissions and agencies, has been one of the worst offenders in spreading the impression that cannabis is a relatively harmless drug.

I would like to offer for the record a copy of my own prepared testimony before the Shafer Commission. I appeared before the Shafer Commission, and I have no evidence whatsoever that any of the significant and important things I was able to tell them had any impact, or got to any use by the committee. Also, when I appeared before the Shafer Commission, I was humiliated and attacked in a most unbelievable way, not only by one of the promarihuana commissioners, but also treated rudely and badly by Governor Shafer himself.

Mr. MARTIN. Would you be prepared to name the promarihuana commissioner?

Professor JONES. Professor Ungerleider, a colleague from the University of California at Los Angeles.

Mr. MARTIN. You are positive in your own mind that he is actually promarihuana?

Professor JONES. I have no doubt from the things that he has written, and I have a letter from him and an exchange back from me on this very subject in the folder.

Mr. MARTIN. Would you continue?

Professor JONES. Reports of the Department of Health, Education, and Welfare, are inadequate scientifically, do not treat accurately the principal matters needing clarification and, in many instances, are likely to lead the public to believe that science has proven marihuana harmless. Upon the release of the HEW report on marihuana, 1973, the Detroit Free Press carried this story:

> Study Finds Marihuana Not Harmful * * * The definitive answer probably is years away, but the Federal Government, particularly the Department of Health, Education, and Welfare, is commissioning many projects to find out—

(Remember, it was HEW's surgeon general that issued the now famous cigarette warning that appears on every pack.) But one of the first HEW studies to be completed comes to an astonishing conclusion: Chronic use of marihuana has no apparent harmful effects.

The above listing of propaganda, propagandists and invalid reports does not by any means cover all the sources of these harmful activities. As of May 1974, several State legislatures are considering bills that, if passed, will for all practical purposes, legalize marihuana. In Washington, D.C., the Mayor's Advisory Committee on Narcotics Addiction recommended the "legal growth, manufacture, and supply of marihuana." The first point of the chairman, Mr. Frank H. Rich, was, "No demonstrable evidence is available to support the assertion that marihuana use is hazardous or detrimental to the physical or mental health of the user." He acknowledged credit to the Shafer Report and to Professor Kaplan's book, "Marihuana—the New Prohibition". The sources of propaganda are cited as references again and again, as though they were valid, and when the work depends on these sources, it makes no use of the available scientific information.

THE MEDIA AND PROMARIHUANA PROPAGANDA

For a decade now, newspapers, journals, radio, and television have repeatedly featured promarihuana spokesmen like Timothy Leary, Joel Fort, Lester Grinspoon, and Norman Zinberg. If the principle of equal time were invoked, the networks would by now owe some hundreds of hours, at least, to scientists whose work on marihuana had led them to the opposite conclusion. In placing their facilities at the disposal of this onesided propaganda campaign, the news media may have succeeded in brainwashing themselves, in addition to the brainwashing of a substantial portion of the American public. At least, one cannot escape the impression that many people in the media now seem to have convinced themselves that marihuana is perfectly safe and that the public interest demands its legalization.

The Shafer Commission Report, paraphrased, said: "Marihuana is harmful; however, let us decriminalize it." The propagandists in the media are, perhaps, somewhat more consistent. Though they quote the Shafer Report and the Consumers Union Report, they are likely to put the argument in these terms: "Marihuana is safe; let us legalize it." In the form of arguments most commonly propagated by the media, the call for legalization is almost invariably preceded by some kind of assurance that marihuana is safe, or at least relatively harmless: you use it and live without any apparent difference.

The form of presentation that started in the underground media moved upward into the "respectable" journals. I choose these examples as flagrant propaganda:

Esquire, July 1968, published an article by Timothy Leary, "In the Beginning, Leary Turned on Ginsberg and Saw that it was Good . . . And then Leary and Ginsberg Decided to Turn on the Whole World." This is a personal testimonial by Leary of the solace and comforting strength he claims to have found in his cult of free sex and drugs.

Playboy, October 1969, carried a lead article by Joel Fort, M.D.: "Pot: A Rational Approach." This article is an uncritical review of Grinspoon, Zinberg, Weil, Mikuriya and other sources commonly used to give the impression that scientific findings confirm the safety of marihuana or at least the lack of significant adverse effects. I quote an excerpt:

> And marihuana, decidedly, is not a narcotic, although just what it should be called is something of a mystery. The tendency these days is to call it a "mild psychedelic," with emphasis on mild; this is encouraged by the Tim Leary crowd . . . and by those to whom psychedelic is a monster word denoting hallucinations, insanity, suicide, and chaos.

The text goes diffusely on to scramble pharmacological terms. The point is, Dr. Fort claims marihuana is a very mild something. The same Dr. Fort was quoted by the Oakland Tribune, May 26, 1966:

> LSD THREAT LESS THAN ALCOHOLISM—LSD is dangerous enough, but it poses a far lesser threat to the populace than alcohol, sedatives, stimulants and tranquilizers, or even the use of tobacco, according to Dr. Fort.

He was asking clergymen to help maintain an unbiased attitude toward this powerful new drug. Even readers of Playboy are entitled to a reasonable degree of competence in a supposedly scientific evaluation.

Psychology Today, January 1973, carried an article by Timothy Leary: "The Principles and Practice of Hedonic Psychology and an Explication of the Seven Levels of Consciousness (Pleasure)." It is fair to say that this is an unrestrained effort to recruit the reader into the Leary world of marihuana and beyond.

Surely the media have an obligation to end the one-sided exposure of readers and viewers to this kind of propaganda. It is, of course, interesting to have essays in science fiction, but is this not too much? And can it qualify as science at all? True science fiction has always been an extrapolation from scientific observation; these stories are based on illusion.

THE ENTERTAINMENT INDUSTRY AND PROMARIHUANA PROPAGANDA

Another important element in the barrage of promarihuana and prodrug propaganda is the output of our entertainment industry.

There have been prodrug films such as "Easy Rider", which sympathetically portrayed the life of young people caught up in the drug culture, including the use and sale of marihuana.

And then there was the brilliantly made but criminally damaging film, "Superfly," which glamorized the lives of two black cocaine wholesalers, in a manner which brought protests from black community leaders in Washington, D.C., and in other cities. I quote what the New York Times film reviewer said about "Superfly," because I consider this statement to be illustrative of the blindness and tolerance—yes, and the perversity—that has reduced our media in too many instances to handmaidens of the prodrug propagandists. Here is the quote:

> That the film—Superfly—does not also belong with those movies portraying the evils of drugs must be the result of very intelligent calculation; for there is no moralizing, not even the subtle silent kind, and the film's most eloquent spoken passage is given to Priest's partner—Priest is "Superfly"—when he defends dealing as a way of life.

In March 1971, Edith Efron wrote an article for TV Guide analyzing 24 "drug dramas" that had appeared on 14 dramatic series over the previous year. Heroin was given uniform and negative treatment in the plays. Five of these plays portrayed the hazards of pep pills and barbiturates. But only one play dramatized the hazards of marihuana. Summing up, Ms. Efron said:

> What does all this add up to? It adds up to this: a flood of plays allegedly reflecting the contemporary white "drug culture," which soft-pedal or omit every major aspect of that culture, * * * which strongly intimate that the guilt for the drug epidemic lies with white middle-class America and its traditional values * * * which morally whitewash the drug takers * * * and which portray—in the case of the heroin addicts—their intense medically documented suffering.

The recording industry has played a major role as a vehicle for prodrug—primarily promarihuana—propaganda. Scores of such songs have been recorded by folk singers and rock groups and became best sellers and top favorites of disc jockeys across the country. Some of the better known ones are: "White Rabbit", "Magic Carpet Ride", and "Comin' Into Los Angeles."

In early 1971, the FCC issued a warning about broadcasting song lyrics that might encourage young people to use or experiment with drugs. Some of the stations reacted affirmatively to this warning. But some resisted. The Recording Industry Association of America petitioned the FCC to rescind its warning because, it said, the warning has become a "rallying cry for arbitrary action by censors and vigilantes." James Caroll, program director of WKCR–FM at Columbia University, told the New York Times: "For them to try to suppress drug songs is a tendency to stomp all over the First Amendment."

I'm all for the First Amendment. I believe it was Justice Holmes, however, who pointed out that the First Amendment does not cover the right to shout "Fire" in a crowded theatre. Although I am not a lawyer, I feel strongly that it also does not cover the right to carry on a false and insidious propaganda campaign in favor of drugs which have already destroyed the lives of hundreds of thousands of young people—a campaign which will, if it goes unchecked, seriously undermine the health and morale of our people and the security of our Nation.

The above observations do not reveal the full extent to which the broadcast media or the media of print push marihuana. Leary followers are abundant in the world of the media and remarks about pot are common, as common today as remarks about tobacco or alcohol. In California during the public debate in 1972 over the initiative measure to legalize marihuana, the media were careful to try to obtain competent persons to present the opposing side. Making such presentations fatigued the few experts who could give the accurate information needed. On the promarihuana side, no expertise was necessary to give the argument centering on keeping the marihuana user out of jail—a misleading argument, but one with appeal. Dr. Fort and a large number of lay persons took advantage of every opportunity they could to speak for the proposition. In almost every instance, their real argument was "It's safe." The authority quoted was always the Shafer Report, used in a way to obscure all the cautionary passages.

The media need to do some searching of conscience to find the means of achieving balance when qualified professionals are not available.

THE ROLE OF RADICAL PROPAGANDA

Radical propaganda has also played a major role in the spread of the drug epidemic and, in particular, of the marihuana-hashish epidemic.

When I say "radical", I mean primarily the New Left rather than the Old Left. The New Left has today lost much of its strength, but just a few years back it was a potent force, on and off the campus. It was a broad and variegated phenomenon. Although some of the organizations and leaders and publications involved in the New Left appeared to be "far out," or even entertaining, virtually all of them had to be considered revolutionary in the sense that they were militantly opposed to the capitalist system and the established order and favored the use of violent means to bring about its overthrow.

Perhaps the principal vehicle of the New Left movement was the underground press. The underground press has undergone considerable attrition in recent years, but not so long ago every major American city had one or several underground papers, and even relatively small cities had their own local underground press. The small papers circulated no more than a few thousand copies per week; the larger papers had weekly circulations that ran as high as 200,000. It has been reported that, at the height of the phenomenom, there were some 800 underground papers in the country, with a total readership of roughly 20,000,000 young people.

I have yet to see an underground newspaper that was not actively engaged in the promarihuana propaganda campaign. Let me give you a few examples of their propaganda.

Timothy Leary, the guru of the New Left drug cultists, was carried almost on a syndicated basis by just about the entire underground press. Let me quote a few of Chairman Leary's words of wisdom.

On January 2, 1969, Leary told the Berkeley Gazette: "Drugs are the most efficient way to revolution * * * I'm for anything that disrupts the university. The only way a university can serve any useful purpose is in turning people on and making them feel good."

On October 25, 1969, Leary wrote an article for the Los Angeles Free Press, an underground paper, in which he said:

> I think dealing is the noblest of all human professions, and urge any creative young person to consider it * * * I remember talking recently to a group of clear-eyed, smiling, beautiful dealers. They were young men in their twenties, as all dealers have to be young. At that time their life situation was close to perfect.

In a tape recording brought back by Jennifer Dohrn after visiting Leary in Algeria in October 1971, Leary said: "Blow your minds, and blow up the prisons and the controlling centers of the genocidal culture * * * The political revolutionary must be turned on to seek and tap his internal energy."

I offer copies of these items for the record.

I have here another item, from The Rat, a Bay Area underground paper, dated October 8, 1969. Here is a brief excerpt: "* * * when the youth in large numbers embraces pot, it signifies a very funda-

mental rejection of Amerikan bourgeois society." American is spelled with a "k".

The Berkeley campus had an official publication called "Orientation." I have here an item taken from an underground counterpublication called "Disorientation: notes from the underdog." Let me quote one brief paragraph: "Society hates drugs because they can give people ideas and visions of beauty and love and make them realize that this current society has to be brought down and totally rebuilt."

Mr. MARTIN. Do you believe the underground press exercised any significant influence on our young people in promoting the cannabis epidemic?

Professor JONES. I think there is no doubt whatsoever it had a tremendous impact. Here are other things, here is a thing related to the underground press which is actually a book—this is a photo copy part of the book—it is in the same vein, it is incredible.

Mr. MARTIN. Why, if it is a New Left booklet, do you consider it promarihuana?

Professor JONES. Because from the beginning there was an intertwining of the New Left with the drug movement.

Mr. MARTIN. And this is representative of the book itself?

Professor JONES. It is representative of the book itself, and there are many other statements, especially in the White Panther Society—I have a copy of their text here, too. The platform of the White Panthers is under point 3, and it says, "Total assault on the culture by any means necessary, including rock-and-roll, dope, and"—excuse me—"——— in the streets."

I'm afraid I'm a little callous on some of these four-letter words, coming from a community——

Mr. MARTIN. It will have to be edited when the record is printed, Professor Jones.

Professor —ONES. This is the flag of the White Panther Society. You can see that over the red star there is a marihuana leaf; it is not a fig leaf, it is a leaf of the cannabis plant. The White Panther Movement may by this time have gone out of existence, but it was at one time a very active group. I have here as another exhibit a photograph taken at the White Panther booth at a Michigan rock festival.

A typical example of New Left drug propaganda is a formal publication by Lyle Stuart, Inc., New York, "The Anarchist Cook Book"—which I show you here. In addition to recipes for bombs to be made "in the kitchen," methods for the preparation of many drugs are given. Ordinary recipes include instructions for making marihuana salad, hashish soup and hashish cookies. The introductory chapter on drugs states: "The use of drugs comes under the birth of a new culture * * * The use of drugs in this new culture will be free * * * for there will be no more jails." And the author quotes Jerry Rubin: "Pot is central to the revolution. It weakens social conditioning and helps create a whole new state of mind. The slogans of the revolution are going to be pot, freedom, license, the bolsheviks of the revolution will be longhaired pot smokers." [1]

[1] The original quotation is from Avant-Garde, N.Y., March 1969, p. 33. Article by Peter Schieldahl, "Thoughts of Chairman Jerry."

FLAG OF THE WHITE PANTHER PARTY

(The body of the flag is black; the center star is red; the superimposed marijuana sprig is green)

I have in the files that I have brought here today and in my files at Berkeley literally thousands of such items, culled from the underground press and leftist publications. There is absolutely no doubt in my mind that the total impact of this propaganda, endlessly repeated in hundreds of underground papers across the country and in thousands of tracts, played a major role in the spread of the drug epidemic.

The underground newspapers were generally not identified with any specific New Left organization, although they shared the New

Left ideology. The formal organizations in the New Left movement were divided on the issue of marihuana. SDS—Students for a Democratic Society—to the best of my knowledge, did not encourage the use of marihuana, although its members were far from being drug teetotalers. Marihuana has been regarded with favor, however, by the Weathermen, the Black Panthers, the White Panthers, Leary's Brotherhood of Eternal Love, and, currently, by the Symbionese Liberation Army. In the case of the last-named organization, I have a document which shows that marihuana is used in a ritualistic manner by the SLA.

It must not be imagined that these New Left revolutionaries were ineffective because they were so strange—even kooky. The thing that made the New Left revolutionaries effective despite their strange ways was that they were always sensational news; and they were, in consequence, frequently able to exploit the curiosity of the press in order to promote their promarihuana propaganda. In his book, "Future Shock," author Allen Toffler quoted this passage from a letter written by New Left poet Allen Ginsberg to Timothy Leary:

> Yesterday I got on TV with N. Mailer and with Ashley Montagu and gave big speech * * * recommending everybody get high * * * Got in touch with all the liberal prodope people I know to have [a certain prodrug report] publicized and circulated. I wrote a five-page summary of the situation to this friend Kenny Love on *The New York Times* and he said he'd perhaps do a story (newswise) * * * which could then be picked up by U.P. friend on national wire. Also gave copy to Al Aronowitz on New York *Post* and Rosalind Constable at *Time* and Bob Silvers on *Harper's* * * *.

It is to be regretted that our media—including reputable newspapers and TV personalities and publishers—permitted themselves to be used by the New Left propagandists. As an illustration of what I mean by "permitted themselves to be used," I have here a copy of "The Little Red School Book," which was published by the Pocket Book Division of Simon & Schuster. "The Little Red School Book" is a militant New Left sensualist manual, written at a junior high school level. It gives explicit instructions on how to take over the classroom, intimidate the teacher, engage in sexual intercourse, masturbate, take the pill, on how to become involved in expanded sexual experiences, and on how to use drugs. On page 183, it reads:

"Remember, being high can be fun. But don't count on working or learning anything while the sensation lasts."

The Communist Party itself has not participated in the promarihuana propaganda campaign or in the campaign to legalize marihuana. I think it is important to note, however, that Bettina Aptheker, one of the top leaders of the Berkeley uprising and an identified Communist, never dissociated herself from the militant propot propaganda which characterized the uprising and which, over a period of several months, raised the use of pot on the Berkeley campus to epidemic proportions. This, as I have pointed out, was the beginning of the national epidemic: from Berkeley the epidemic spread out to other campuses, then down into the high schools and the junior high schools, and now down into the grade schools and up into the adult ranks of both the blue collar workers and the middle class.

The Communist Party says that it is against the use of marihuana. However, when Bettina Aptheker had an opportunity to use her

immense prestige with the Berkeley students to speak out strongly against marihuana and to oppose it at the inception of the national epidemic—she failed to do so.

The Trotskyists and Maoists have also not participated in the pro-marihuana propaganda, and, at least in the case of the Trotskyists—I do not know about the Maoists—are on record as opposing the use of the drug.

It is interesting to note, however, that when the Communists, Trotskyists, and Maoists, cooperating despite their differences, brought hundreds of thousands of young people to Washington to protest against the Vietnam war, the air of the greater Washington area was heavy with pot smoke for the duration of the demonstration. There is no record of any spokesman for the major Old Left organizations using his command position in the demonstration to discourage the use of pot. And one is compelled to ask: Why?

In his testimony last Friday, Dr. Andrew Malcolm, a Toronto psychiatrist, told the subcommittee that marihuana makes people far more suggestible and therefore far more open to manipulation. This coincides with my own experience with some 1,600 marihuana smokers over an 11-year period. I am convinced that people under the persisting influence of marihuana can be easily manipulated by demagogs of the extreme left or of the extreme right. Marihuana smokers, in short, would be grist for the mill of any future totalitarian movement. Dangerous political consequences may flow from the fact that we already have in our society a body of some millions of chronic users that continues to grow in an exponential manner.

Perhaps the role played by pot in enhancing suggestibility is the reason why the Old Left leaders of the anti-Vietnam demonstrations did nothing to discourage the use of pot among the demonstrators—despite programmatic statements which appear to oppose the use of pot.

THE SCOPE AND DISTRIBUTION OF THE EPIDEMIC

My extensive interviews with drug users and with persons who do not use drugs permit some deductions about the variations in the population by subgroups' tendencies to use cannabis. Economic status has little to do with these variations. Strong religious faith, whether Christian, Jewish, or other, appears to give resistance to the drug. Strong family ties, more frequently found in connection with strong faith, also appear to reduce involvement. In my work with the black community, a scourge of multiple drug use is already evident as an endemic situation; special efforts may be necessary, but such efforts are likely to get community support. The situation calls for urgent action; the longer we wait, the more difficult it will be to reverse the trend.

With regard to the United States as a whole, there is no community free of the problem; it is now as widespread in the rural as in the urban communities. In some respects the rural youth are worse off because no counterdrug activities were organized there since it was felt that these youngsters were not susceptible to the epidemic; but it has simply reached these parts of the country later. As a result, the harm from cannabis might be kept low in rural areas through prompt action because the average length of use of cannabis

is less. This is how I stated the problem in 1968 in a booklet that had more than 1 million copies distributed: "Social pressures among the young to use the dangerous drugs are widespread and, unless the trend is reversed, as much as half of this generation of young people may acquire crippling drug addiction or habituation." To that statement we need only add the genetic hazard.

RECOMMENDATIONS

Now, Senator, I have taken more time than I should have, but I wish to bring to your attention and the attention of the subcommittee four points that I think are very important for you to consider.

1. The first step toward correction has been attained with these hearings—the defining of the problem. The summary papers, representing nearly the full array of scientific information on the subject of cannabis abuse in the world, will soon be in print. It is impressive in the extent to which all sources are in agreement.

There are several examples of the effectiveness of accurate information alone in reducing the abuse of drugs. Therefore, the first recommendation is to make the findings of these hearings available throughout the country without delay. Congress as a whole or the Senate should distribute the hearings at once to local and State governments and to schools, colleges, and public libraries.

2. It is recommended that a special task force on drug education should be appointed by the President, with its members selected from the ranks of those scientists who have sought to face up to the problem rather than to pretend that there is no problem.

3. A working group of experts should immediately plan and formulate methods for rehabilitating the large numbers of drug-using persons who may seek rehabilitation in response to an intensive educational campaign. Heavy cannabis users need approximately the same degree of care in becoming rehabilitated as do narcotic addicts.

4. Somehow, the legal and organizational means must be found to counter the massive, unopposed promarihuana propaganda campaign that is still going on in our country. I suggest the Presidential appointment of a second task force of leaders in science, medicine, communications, and other appropriate fields, to study the problem and to maintain a watchful view over published materials and broadcasts so as to detect propaganda supporting drug use and to respond promptly, factually, and forcefully in such instances.

I will close with that, sir.

Mr. MARTIN. That concludes your statement?

Professor JONES. Yes.

Mr. MARTIN. Mr. Chairman, I have some questions.

Senator THURMOND. You may go ahead and ask your questions.

Mr. MARTIN. As an expert on radiation, Professor Jones, is there any observation you would like to make in connection with Dr. Axelrod's work on the retention of THC in the brain and other fatty tissue? I ask this question because Dr. Axelrod's research was, as you know, conducted with radioactively tagged THC.

Professor JONES. I was hoping that I would have a chance to discuss that privately with Dr. Axelrod, but I suppose I might just as well engage in this forum.

I followed all the radioactive work, including Dr. Axelrod's and his colleagues'; and I do know, however, that the ease with which radiation labels can be detected is in part in these techniques related to how rapidly it moves into and out of the body tissues.

I notice in Dr. Axelrod's study and those of others that there is still in the order of 20 to 10 percent of THC labeled that is unaccounted for either as THC, or some of the immediate metabolites which still retains impactment in the body well beyond a week. And, although I can't prove it, I can fit very good models to this which suggest that this residue which is retained in the body, in the order of 10 to 20 percent, may persist in the body for a very, very long time, constant indeed, such as would be removed from tissues probably at a rate of about 10 percent a month. And this of course, the 10 percent a month, would match the loss of toxic symptoms that we see in individuals that are poisoned by cannabis.

Mr. MARTIN. From your experience with marihuana users, Professor Jones, I want to ask you a question I asked all the other psychiatrists.

Do you regard the so-called amotivational syndrome as a hypothesis that has yet to be proven, or as a scientifically established fact?

Professor JONES. I regard it as a scientific established fact because I have yet to see a qualified observer that didn't see it in marihuana users. I have interviewed 1,600 of them, and I did see some degree of amotivational syndrome in all of them, including some of the brightest university students that I have had. The level of dosage that may be concerned in amotivational syndrome tends to be in heavier doses, but I still have a number of individuals in whom I can be relatively certain from a clinical point of view that their use of marihuana has been confined to a few times per month, and that they can still have the amotivational symptoms. Now, it's difficult to know, because behavior and brain function is so complicated, as to what particular change, or changes, the amotivational symptom produces.

I would prefer to say that I monitor probably in the order of 20 separate characteristics of brain functions in my interviews from a clinical assessment point of view, and that nearly all of them show some degree of change; and that there is a difference in the pattern from user to user, depending upon dose. So, the great observation that we have from these hearings is reinforcement of that, that all of us who see and carefully evaluate cannabis users detect in them, even when it's over, even up to months beyond their use of cannabis, residual effects on brain and behavioral functions.

Mr. MARTIN. Is this damage to the brain reversible, in your opinion?

Professor JONES. Within my own experience I cannot answer that question. But, I have had individuals, students, whom I have been able to follow for several years that, although they have made remarkable progress back towards being normal functional human beings, they still have some "kookiness" about them which would best be described as effects of cannabis. But, unfortunately I didn't know them before.

Mr. MARTIN. How long do you have to smoke marihuana, and how much do you have to smoke a week to bring about that kind of brain damage?

Professor JONES. There is some disagreement among us here. I point out Dr. Campbell's analysis in England, who did the first study,

undoubtedly was measuring individuals that had very great sensitivity to cannabis, that there was brain atrophy and I believe the data that we have because in many ways the findings have been amply confirmed, and confirmed in these hearings, that these individuals did get brain atrophy of a significant kind in the very areas of the brain that were predicted to be subject to atrophying from the effects of cannabis.

But we still don't know whether the average cannabis user, especially those that seem to use cannabis with more impunity, might get these effects. But, I would prefer to think, at least from the standpoint of cautioning individuals that anyone using cannabis may be inducing in the brain some of these things.

Mr. MARTIN. I would ask you to keep your answers as brief as possible, Professor Jones, because we are running out of time.

Which do you consider the most dangerous—the more dangerous—cannabis or alcohol?

Professor JONES. There is no doubt that cannabis is many times more dangerous. I have often commented on that by saying, 30 times more dangerous.

Mr. MARTIN. Could you in 1 minute, or 2 minutes, tell us why?

Professor JONES. You are asking me to be brief. Well, the changes to dependency occur in those that become dependent 30 times faster with cannabis than they do with alcohol. The brain damage that we see in an alcoholic, and its equivalent to cannabis use, too; but you won't find among teenagers, or those in their 20's, even though they are alcoholics, the kind of brain damage you see in cannabis users who are daily, heavy cannabis users; and they already have all the signs of advanced Parkinson's degeneration of the brain, and other brain changes, too, of a totally irreversible nature, and are only 18 or 19 years of age.

Mr. MARTIN. A question that has been raised is why we don't have widespread noticeable effects of the cannabis epidemic. The epidemic is a big one; cannabis, as you say, is very dangerous and destructive to the body and mind. Why is it so difficult to perceive the consequences, or why do most people have difficulty in perceiving the consequences?

Professor JONES. Well, the cannabis user changes gradually; he drifts into whatever society will support him. He will remain at home, supported by parents; mooching off relatives, mooching off friends; living off charity, living off grants in a college community, or just being a bum, or whatever, if he is badly affected. So, we don't see the individuals listed and categorized in our tabulation of diseases. And because they have also, at least not as yet, not started dying with a tremendously high death rate, although I think that will change very rapidly. But, there has been little public awareness. The drug user tends to remain hidden within the population, that is also true of heroin, they are largely being cared for at the expense of middle-class society, a terrible burden on those who are still working in the parental class. But, the situation will change markedly as the family resources become exhausted and the individuals who are now supporting them approach retirement age.

Mr. MARTIN. What you are saying, I think, is that this is a very insidious drug, which permits the user to look relatively normal, at least to the untrained observer that has no way of knowing that he

is a cannabis user. But he is nevertheless seriously maimed, it has reduced his ability to perform either as a brain worker, or as a mechanical, let's say, blue collar worker.

Professor JONES. Well, I don't think there will be many individuals who are high class and use cannabis. And all of us should be worried right now about the fact that so many medical students and young physicians are using cannabis. I personally don't think a cannabis user can take responsibility for another person because this part of his brain is missing, it's not connected, it's not working. He is highly prone to make errors in a situation which is new. He can carry out routine things, but his ability to function becomes worse and not better. The average person, especially in their young, pre-middle age period, grows and mature noticeably in every passing year. The cannabis user either remains stationary or regresses in mental powers back to childhood.

Mr. MARTIN. You feel that abandoning the prohibition would have a more serious result than abandoning the prohibition on the use of alcohol?

Professor JONES. I believe every time drugs are made freely and legally available that use increases. I have never talked with anyone, including drug users, who didn't believe that cannabis use would increase if it was legalized. Most young people who do not now use drugs tell me the reason they do not use drugs is because it's illegal. And I think many of them now in the near absence of good, cautionary information, would be tempted to use cannabis if it was legalized, and it is more likely that they would be trapped in that decision than getting enough wisdom and making an independent judgment.

Mr. MARTIN. Thank you very much, Professor Jones; there are many more questions I would like to ask you, but our time is running out rapidly. We still have Mr. Cowan to testify, and I will have to terminate my questions.

Professor JONES. I am sorry to have cut into Mr. Cowan's time because I know he has many things to tell us.

Mr. MARTIN. You cut into your own time, too. Thank you very much.

Mr. Chairman, may the additional documents which Professor Jones offered for the record be incorporated at the discretion of the subcommittee in the appendix material?

Senator THURMOND. Without objection, that will be done.

If counsel has any further questions he wishes to prepare, and have these witnesses respond to, if they would kindly do that, those could be included in the record.

Mr. MARTIN. Thank you very much, Mr. Chairman.

Senator THURMOND. They could be done in writing and included as part of the record; they have already been sworn.

Mr. MARTIN. That would simplify the matter greatly, Mr. Chairman.

[The following questions and answers were subsequently supplied for the record:]

Question. Dr. Jones, Dr. Malcolm made the point that marihuana users have impaired judgment under the acute effects of marihuana. Would you comment

on this point, particularly in regard to your statement that your observations, largely of students, were made while they were not acutely affected?

Answer. I have found that cannabis users, while not acutely intoxicated, persistently show a pattern of undesirably altered mental functions:

(1) They use *non sequitur* in speech—that is, their conclusions do not follow from their premises—and they preferentially accept *non sequitur* from others.

(2) They are easily induced into risky, impetuous, and foolish behavior, such as acceptance of heroin, LSD, other dangerous drugs, and homosexual experiences, which are afterwards regretted.

(3) There is a narrowing of the usually wide range of facial expressions that reflect the complexity of thought formation; the habitual facial expression tends to become a mask.

(4) There are gaps and abrupt transitions in expressing their thoughts.

(5) There is usually pallor of the face and almost no changes of color with the emotions of social discourse; blushing is reduced or absent altogether.

(6) Weakening of short-term memory often appears in conversations; significant points comprehended early in the conversation escape a few minutes later.

These effects are probably less marked in university students than in other cannabis-using persons of the same age. University students are probably not as indolent as the average cannabis user because those most heavily affected undoubtedly drop out of college. Among the cannabis-using students I have known, those with the most severely depressed mental activity have indeed quit college. There are also many testimonials of such dropouts who quit cannabis and were able, after several months, to return to their former activities, including their studies.

I also have seen a few relatively heavy cannabis users who are impetuous rather than repressed into inactivity. From my partially formed opinion about them, they probably continue to function because of superior intellect. But they are still affected, showing the *non sequitur*, the masked face, pallor, and rash behavior.

I am concerned about cannabis-using physicians I have seen among the recent graduates of our medical schools. There are reports that as many as half the medical students of the last 5 years have been using cannabis. Some of them unquestionably drop the habit before they become practicing physicians—but many do not. I have talked briefly with approximately 40 young physicians who report using cannabis. At least a quarter of them show the physiological changes I have described. They defend cannabis use by quoting the medical pseudoscience—but they have never examined the scientific studies.

In view of the life-and-death responsibilities of physicians, impairment of their judgment by cannabis use must be regarded as a major threat to the public welfare.

Question. Dr. Jones, in your testimony you state that the number of drug users of each kind has been increasing by approximately 7 percent per month in recent years. Is this intended as a firm estimate—or are you offering this figure as the median of a range of estimates? I ask this question because from my own reading of the literature, it doesn't appear that we have sufficient information to make a precise estimate possible.

Answer. Yes; I should clarify my calculations. I have used various rough methods to measure the rate of increase in drug users. The range is 5 to 10 percent increase per month since 1965. The median, or average of all of them is 7 percent per month. The rate is similar if we consider separately the users of marihuana, hashish, or opiates, the extent of barbiturate or heroin addiction, the records of drug arrests, or the quantities of drugs seized in illicit drug traffic. In May 1974, my statistics on University of California men show that 15% of freshmen, 35% of sophomores, 58% of juniors, and 90% of seniors use cannabis. The year-to-year increase turns out to be exponential—like compound interest—but the rate depends on whether we assume that the compounding goes on only during the nine months of the school year or throughout the twelve months of the calendar year. The rate of increase in percentage of cannabis users during a 4-year university education is then 6% per month (assuming 12 months of exposure) or 8% per month (assuming 9 months of exposure).

Question. When you say that the epidemic has been spreading at an average

rate of 7 percent per month and that this rate is exponential—wouldn't such a rate of increase completely saturate our society in just a few years time? Wouldn't there have to be a leveling off somewhere along the line?

Answer. You are quite right. The 7 percent figure is characteristic of an epidemic at the height of its spread, when there is still a large susceptible population. This is where we stand with the marihuana epidemic today. Obviously, it can't go on at this rate indefinitely. Even if nothing is done, somewhere along the line it has to level off, because the susceptible population categories have been saturated. If nothing is done to bring it under control, however, the epidemic is going to level off at very high point. With a concerted campaign, we can get the curve to level off sooner, and then, hopefully, turn it downwards.

Question. The subcommittee has received testimony suggesting that marihuana must be regarded as a kind of universal threshold drug which frequently leads to the use of other drugs, including the opiates. On the other hand, it has been stated in the Shafer report and elsewhere that there is no evidence that the use of marihuana leads to heroin addiction. Does your own experience throw any light on this aspect of the problem?

Answer. That marihuana does lead to the use of other drugs has been established by many studies. For example, the Annals of Internal Medicine for 1970 carried a survey of college students by Crompton and Brill which reported that 100 percent of heavy marihuana smokers used other drugs; 22 percent of those who smoked marihuana monthly used other drugs; while no other drugs had been used by those who never smoked marihuana.

The assumption that cannabis use does not lead to heroin comes from misleading statements such as, "marihuana does not necessarily lead to the use of heroin." As so stated, it is true, for most cannabis users in the United States have not taken up the use of heroin, even occasionally. It is also true that some cannabis users will never use heroin; however, at least half the cannabis users are susceptible to the temptations and invitations to try heroin.

The association between marihuana and subsequent heroin use is indeed remarkably high. In my recent drug history sampling of 400 college men, 280 took up use of cannabis in some regular pattern, and after that 40 percent of them (118 cases) used heroin or other opiates one or more times. One hundred twenty had not used cannabis; none had tried heroin. From interviews of soldiers in Vietnam in 1972, I found the soldiers who smoked tobacco cigarettes were often offered cigarettes laced with heroin. The tobacco smokers declined the offer if they did not also use cannabis. Not all cannabis smokers accepted heroin-laced cigarettes, but the majority did over a period of prolonged contact. In the United States over the past 2 to 6 years, 0.5 to 1 million heroin addicts have come from the cannabis-using subpopulation. This has been estimated at 30 to 35 million, of which several million use cannabis daily). The transfer from cannabis to heroin addiction is approximately 3 percent per year, and the transfer from cannabis use to some heroin use is about 7 percent per year (Use of opiates infrequently enough to avoid frank addiction is, at this time, more widespread than addictive use).

In a study of 850 hashish users in Cairo done by Professor Soueif at the request of the Egyption Government (Soueif, Bulletin on Narcotics 23: No. 4, Oct.-Dec. 1971), it was found that the transfer to opium use from hashish use was 3 percent per year, exactly in agreement with my findings in the United States. The graph submitted by Professor Soueif when he testified clearly establishes that the incidence of opiate use is directly related to the number of years of hashish exposure.

When I stated to my drug abuse class in April 1973 my statistical computation that about 10 percent (approximately 3 percent per year) of daily marihuana users in the United States have become heroin addicts in the 3-year period 1969–1972, I was challenged. A group of procannabis students conducted a poll which they proclaimed, both in advance and on completion of their findings, to show that I was wrong. Based upon 50 percent returns from 700 mailed questionnaires, they showed 2 percent of students to be heroin addicts. What they did not reveal in their press release was that 5 percent of the marihuana users or about 10 percent of daily users were heroin addicts. Allowing for statistical fluctuations in samplings of this size, and for the fact that heroin addicts are likely to drop out of college, this survey is a good confirmation of my statement that about 10 percent of daily marihuana users in the United States as a whole have become addicted to heroin.

When we look at the problem from the other direction, the association between heroin and prior cannabis use is even more startling. Most surveys of heroin users show that the prior use of cannabis is in the range of 85 percent to 100 percent. In my own studies of drug users, where I employ the interview technique (which I find more reliable than the survey technique to obtain such information), the percentage is close to 100 percent. In 102 consecutive cases of heroin-using soldiers, all had used cannabis regularly prior to taking up the use of heroin. In 367 additional heroin addicts interviewed by me in the United States, only 4 had not used cannabis prior to heroin use.

Another misleading statement often made by the advocates for the legalization of marihuana, namely, that "all heroin users drank milk as infants" is foolish, the assumption being that marihuana is no more a stepping stone to heroin use than is milk. We could equally say "all heroin users were born." It is true that the majority of heroin users undoubtedly drank milk as infants. About 100 percent drank milk, and about 100 percent have used marihuana. But from the other direction, of those born, or who drank milk, only 1 percent use heron, while the marihuana users, 30 to 40 percent have tried heroin—too high to dispute the cause and effect relationship.

Although the nature of the transfer from cannabis to heroin (or to other drugs) is not completely known, there are some explainable reasons:

a. Peer pressure and depressed good judgment;
b. Desire for increased senusual effects;
c. Suppression of judgment brought about by chronic use of cannabis;
d. Crosstolerance.

Although medical texts cite there is no evidence of crosstolerance between cannabis and opiates in humans, there are animal behavioral studies that show crosstolerance. Some degree of similar chemical action would be expected because of the marked similarity in chemical structure between opiates and cannabinols. In my studies, daily users who have transferred to heroin use do not show cannabis withdrawal symptoms (restlessness, sleeplessness, etc.)—indeed an indication of crosstolerance. Crosstolerance, then, enables the cannabis user to have increased sensual effects from heroin without the unpleasant withdrawal symptoms of cannabis.

From the fact that some observers of heroin-using soldiers reported, in 1971, a small fraction who began heroin use without first using cannabis, I postulated that as a larger fraction of soldiers or civilians became heroin addicts and heroin advocates, there would be more direct assumption of heroin taking without prior use of cannabis. This has not turned out to be the case. In 1971 essentially all heroin users first used cannabis; they do now also.

Question. I have another question to ask with regard to your estimate that the number of drug users of each kind has been increasing by approximately 7 percent per month in recent years. There does appear to have been some reduction in the use of heroin and LSD over the last two years, does there not?

Answer. That is correct. There has been an improvement because there has been an all-out campaign of public education by various government agencies, which has been completely supported by the media. But there has been no comparable campaign directed against marihuana, hashish, amphetamines or other drugs—and in the case of these drugs, we are still afflicted by a continuing monthly increase in their consumption. Marihuana is perhaps the worst of all because, as I have pointed out in my previous testimony, there has over the past decade been a massive campaign of deceptive propaganda designed to make potential users believe that it is relatively innocuous and that it affords pleasures that cannot be found with any other drug or in any other way.

Question. In observations on effects of cannabis, can you make a further distinction for us between scientific evidence and clinical evidence that marihuana is perhaps without harm at some level of use? Do any scientists actually say that it is safe?

Answer. Clinical evidence is derived from an experienced person's subjective interpretation of symptoms of health and disease, such as subtle irregularities in the sound of the heartbeat or the sounds produced by thumping the chest. Diagnoses made scientifically by using the physical record produced by the electrocardiogram or the chest X ray are more objective. A group of physicians may examine and discuss such a record and come to a consensus on the most probable interpretation. Thus, the scientific measurement results in a smaller

range of difference of opinion. In practice, both kinds of observations are needed because they do not necessarily measure the same functions.

In estimating the effects of drugs, behavior and mental functions are extremely important; they are not (except in rare instances) correlated with electroencephalograms, X rays, or chemical measurements of blood or cerebrospinal fluid. Consequently, we have to rely chiefly on clinical evidence or *soft* data, in contrast to *hard* data from chemical or physical measurements. In a few cases, hard data have confirmed some of our clinical observations. For example, many of us had concluded that there are pleasure centers in the brain that are somewhat selectively affected by sensual drugs. In my published papers I had come to the clinical conclusion that cannabis first stimulates and then depresses the appreciation of pleasure, and so have Drs. Kolansky and Moore and others. We have used the terms, "sensory deprivation" and "depersonalization," in describing this toxic effect deduced from our clinical studies. Now, Dr. Heath has physically located the pleasure centers in humans so that there can be no doubt about their existence; his observations are *hard* data.

Most toxic substances appear to have a threshold of dose below which the body can cope with their harmful effects so that no scientific or clinical evidence of damage is apparent. A few substances, such as salts of the heavy metals—for example, lead or mercury—tend to accumulate in the body, usually in a specific organ. In that event, the effect of continual exposure to small doses is long delayed; the damage may not appear clinically for years, and it has sometimes been difficult to associate the effect with its cause.

There is hard scientific evidence that THC does accumulate in the brain and is removed very slowly. This was the subject of Dr. Axelrod's testimony. No scientist could therefore pronounce marihuana "safe" at any level of continuous use. The amount of damage may be too small to measure, but the only valid conclusion from the evidence is that some damage must occur with persistent use of marihuana. There is no process by which science can prove any substance completely safe; it can only report that the known tests to detect certain kinds of injury have yielded negative results. In this case, the tests for THC in the brain gave positive rather than negative results, so science cannot be called upon to endorse marihuana use.

Question. Do you think the significance of Dr. Axelrod's work has been adequately understood?

Answer. Let me add to what I have already said on the subject of Dr. Axelrod's work. The work of Dr. Axelrod and his colleagues* establishes the highly significant point that the active ingredient of cannabis stays long in the body. In a week's observation of human volunteers who were given aliquots of radioactively labeled delta-9 THC, only 65 to 70% of the material had been eliminated from the body by the end of one week. Of the residue in the body, as tested by analysis of blood samples, the major fraction was still in the form of delta-9 THC or its psychoactive metabolite 11-hydroxy-THC.

There tends to be considerable misconception in the current literature over the significance of this pattern of retention. I make the following points, based on analysis of the quantitative data reported by Axelrod et al.

1. Although the blood levels of THC decline during the first few days with a half-time of 1 to 2 days, the continued appearance of THC residues in the urine and the feces indicates that the remainder of the THC has moved from the blood to storage in other body reservoirs, from which it is removed with half times of one week or longer.

2. In Dr. Axelrod's human studies, there was no analysis of uptake by body fat or in brain or other organs. Some deductions can be made, however, from the companion studies he made on rats given radioactive delta-9 THC. The reservoir of retention of THC in the rat is body fat, and the THC absorbed by the fat is given up slowly. This effect can be measured by the uptake of THC in fat under conditions of repeated administration of labeled THC and by the disappearance from fat when a single injection of the drug is administered. The nearly linear accumulation of THC by fat over a 28-day period in which

* Analysis of the Metabolic Fate of delta-9 THC in Findings Reported by Dr. Julius Axelrod and His Associates: Pharmacological Reviews *23*: (4) 371–380, 1971; Science *170*: 1320–1322, 1970 and *179*: 391–393, 1973; Annals of the N.Y. Acad. Sci. *191*: 142–154, 1971 (See Appendix).

equal quantities of labeled THC were administered every other day, clearly indicates that there is long-term retention of the THC in fat. In these observations in rats, it appears that the fat releases THC with a half-time of several weeks. Thus, the daily rate of loss approximates only 1 to 3%.

3. The slow release of THC from fat, as observed in rats, tends to imply similar retention of THC in humans who smoke marihuana and hashish. We can expect that the retention of THC in fatty tissues of humans is longer than in the rat because the rat's metabolic rate is about three times greater than the human rate. Thus, release of labeled THC from human fat is likely to have a half-time approximating a few months rather than a few weeks as in the rat.

4. It may be a coincidence that the rate of disappearance of THC from the human body as measured by appearance in the urine and feces is approximately the same as the rate of disappearance of THC from the fat of rats.

5. In the THC studies, the metabolic processes most likely to be detected are those with the fastest rates of turnover, since they produce the highest concentrations of the labeled material. Thus, the data obtained by Axelrod on the elimination of THC probably describe only the more rapid processes, while the 20 to 30% residue of labeled THC is removed remarkably slowly, requiring weeks for certain, and probably months, to be eliminated. The rate of removal may, in fact, match the slow regression of mental symptoms on abstinence from cannabis abuse, which occurs at approximately 10% reduction in symptoms per month.

6. The retention of THC and its metabolites in brain tissue is an important consideration. The Axelrod observations show that the rat brain's cumulative concentration of labeled THC is about 5% that of liver and 1% that of body fat when THC was administered every other day for 28 days. Apparently, most of the THC taken into the body goes to body fat (perhaps the uptake in visceral organs depends on fat content) while the brain gets a small fraction. Assuming that the distribution of THC derived from smoking cannabis is the same in humans as that of injected THC in the rat and that the average exposure to THC through marihuana smoking causes 10 milligrams to enter the body, then less than 1% of it would be deposited in the brain. This would mean that the amount of THC or its metabolites that affects the brain is indeed small, since a dosage of 0.1 milligram or 100 micrograms distributed to the whole brain would induce intoxication. It also suggests that a few hundred micrograms of the active material held for a long time in the human brain may be responsible for the persistent effects associated with the behavioral changes seen in chronic marihuana users.

I wish to make another statement of some importance based upon the same point, that only a small quantity of the active ingredients of marihuana injures the brain. At least one research project in California sponsored by the National Institutes of Health is giving to human volunteers injections of several hundred milligrams of pure delta-9 THC, also supplied by the National Institutes of Health. These quantities in single applications, especially within the blood stream, hazard real damage to brain tissue.

Question. Dr. Axelrod expressed the belief that marihuana may result in "reverse tolerance," and he offered an explanation for this observation. From your past writings, I know that you believe the concept of reverse tolerance is based on erronous observations. Could you tell us why you believe this concept to be in error?

Answer. Dr. Axelrod believes that "reverse tolerance"—that is, the development of a given effect with smaller and smaller doses as use of marihuana continues—is explained y the fact that, with heavy marihuana use, there is increased enzyme conversion of the delta 9-THC to the more active 11-hydroxy-THC. I have every confidence in his work and do not doubt that this phenomenon plays a part in the effects I have observed in persons during their initiation into marihuana use.

From my studies of cannabis users, I find that the first few smokes of reefers produce minimal effects; whether the person consumes 4 to 6 all at once or over a period of several weeks, he does not "turn on" until about the 4th to the 6th "joint." He has now reached his most sensitive level because of the accumulation of THC in his system, perhaps augmented by the conversion noted by Dr. Axelrod; and, for the next few times, he may renew the high by smoking just part of a reefer. He is likely to remain at that level of tolerance for a

time; but later on, he finds it necessary to increase the dosage, and usually the frequency also, in order to get the same effect. I interpret these observations to mean that THC accumulation is the chief cause of the seeming "reverse tolerance" that brand new users display, but that the habitual user eventually experiences true tolerance—the need for larger amounts of the drug to produce the desired effect.

Qustion. Dr. Jones, you were also present when Dr. Kolodny testified last Thursday on research conducted by a group of Masters & Johnson scientists under his direction, which revealed lowered male hormone levels in marihuana smokers? As a scientist who has studied the physiological effects of cannabis, do you have any reservations about this finding?

Answer. Dr. Kolodny's discovery is, in my opinion, of the greatest significance. I found his research methodology impeccable, and, although he was properly modest about the finality of his findings, I personally believe that they already have the quality of hard scientific evidence. I might point out that four years ago, I hypothesized that marihuana users had less than usual male hormone because they appeared less virile and had less sexual activity. I applied for an NIH grant to test the hormone profiles in persons at various stages of involvement with cannabis or other drugs, or abstinence from them. The NIH study section disapproved the application. Dr. Kolodny now shows unequivocal evidence for the suppression of male hormone in men who smoke marihuana. Despite this, I anticipate that his findings will be misunderstood by some and denied or misrepresented by others.

Question. Could you tell me why you believe that these findings can be misunderstood or misrepresented or denied, when you yourself consider the evidence to have a hard scientific quality?

Answer. This wouldn't be the first time that hard scientific evidence has been misunderstood or denied. In this specific case, there are a number of reasons that make misunderstandings understandable.

First of all, based on my observations of some 1600 cannabis smokers, I have found that feminization in appearance and behavior is only evident in about half of male cannabis users.

Second, in my opinion, signs of suppressed masculinity are most marked in those who are physically inactive. I find, obversely, much less behavioral basis for suspecting depressed virility in athletes using cannabis, even though they may have other signs of functional brain changes.

Third, Dr. Kolodny has matched sexual impairment with suppression of male hormones in cannabis users. In my opinion, it will be equally possible to show in marihuana-smoking males, selected as fully masculine types having normal sexual inclinations, that testosterone levels are in the normal range. I believe, therefore, that we will observe a false dispute of the highly important Kolodny findings simply because it will be easy to pre-select subjects not yet sexually debilitated by their use of cannabis. But the fact that you can find X number of marihuana-smoking males who have not yet been sexually debilitated does not disprove the finding that an equal, or substantially larger, percentage have suffered sexual impairment in varying degrees.

I personally confirm the Kolodny observation and caution those who would dispute it that we are evaluating a drug with a very wide range of patterns of debilitating effects.

Question. Some of the psychiatrists who testified said that cannabis makes people suggestible, that it has an almost hypnotic effect. Does this coincide with your own experience?

Answer. Cannabis does have hypnotic effects. A symptom of this action is the "stoned thinking" of the marihuana smoker. What is not fully realized is that this condition persists, though at a reduced level, between uses of the drug. Stoned thinking is described as use of the *non sequitur*, thoughts and deductions not fully logical but accepted as logical by the cannabis users. One such person is pleased to note the *non sequiturs* in the speech of another; it is what the "pot" user calls good "vibes" and the like. The reinforcement of the foolish notions offered by one cannabis user, reflected upon and echoed by his peers who share the same vibes, is similar to the impetuous acts of gangs of juvenile persons—act now; don't worry about the consequences. Examples include the minor rip-offs (which is to say, stealing) of what is wanted at the moment, without restraint, or the breaking of faucets and plumbing in public lavatories or the urinating on the floor. Why? The answer is: Why not?

The cannabis user, as a soldier in Vietnam, would accept heroin-laced cigarettes; whereas, the other cigarette-smoking soldiers would not. This can happen during a cannabis high, but it is more likely to occur when the cannabis user is sober. Tragic episodes of foolish criminal behavior of U.S. soldiers in Vietnam should be investigated in light of possible ties to cannabis toxicity.

Marihuana users are likely to make impetuous sexual decisons. I first thought that these were confined to the period of cannabis intoxication, but my interviews produced evidence that this generally occurs when the cannabis user is between highs. I have talked to many cannabis users who consented to the propositions of homosexuals who had picked them up from the roadside as hitch-hikers. These young men are likely to be troubled by these experiences. Three such men, after having abstained from cannabis for several months, stated that they were then able to see that they had acted under the spell of cannabis and they would not have been vulnerable had it not been for the suppression of mental powers that they now could relate to cannabis use.

The hypnotic spell of cannabis facilitates and probably induces appeal of the absurd. A century ago, the French scientist, Moreau, recognized this tendency in hashish users and called it "alienation," a term appropriately used today to describe persons altered by cannabis.

Question. Have you read the Third Annual Report to the U.S. Congress from the Secretary of Health, Education, and Welfare for 1973 on the subject of "Marihuana and Health"?

Answer. Yes, I have read the report and studied the findings.

Question. Some people associated with the marihuana legalization lobby have made the point that the 1973 HEW report on marihuana roughly parallels, and therefore appears to bear out, the findings made by the Shafer Commission in its own report. Would you consider this an accurate assessment of the HEW 1973 report on "Marihuana and Health"? Or are there, in your opinion, important differences between the two documents?

Answer. Regrettably, thhe differences are minor and the similarities great.

Question. Would you be prepared to offer your assessment of the HEW report, based on your study of it to date?

Answer. Let me begin by saying I consider it a very biased document. It ignores much of the scientific evidence against marihuana and distorts the meaning of some of the studies that it cites. These were faults of the First and Second Annual Reports, also. All three compare very unfavorably with the comprehensive and accurate report on Smoking and Health published by the Department in 1964; these are neither comprehensive nor accurate.

Though the Report is supposedly directed "to the basic question: What are the health implications of marihuana use for the American people?", it is actually oriented primarily to matters of social acceptability and the relationships of social class to marihuana use. The one-page "Summary", having stated "the basic question", does not mention health again. It speaks of "social patterns of typical use", "the user's self concept", "the cultural context" of use, and the "personal values" of the user, and states that "ascribed characteristics of users [may] represent . . . the institutionalized prejudices of those of higher social status." There is no mention in the Summary of the scientific evidence of organic and functional damage to the brain, or of damage to the hormonal system or to chromosomes. A reader of this abbreviated "Summary" would conclude that marihuana has no effect on health. The rest of the Summary section does treat issues of health but from a biased viewpoint.

Parts of the Report seem like a sharp lawyer's defense of marihuana. In playing down the seriousness of the problem, for example, the Report states (p. 5): "The rate of increase [of cannabis use] in some segments of the population may have diminished." Many readers would gain the impression that *use* has diminished rather than that the *increase* in use *may be* somewhat slower than formerly—that the use of marihuana is definitely increasing.

With regard to the linkage between cannabis and LSD or heroin, the Report is incorrect. I disagree with the statement, "Heroin use in this group [college students] is extremely uncommon." My studies have found that 20% of the cannabis users in the university population that I have studied have tried heroin. Very few of them have become addicts and, as I pointed out in answer to a previous question, those who become addicted drop out of college; but I believe that the statement in the Report is misleading, since I regard even one

or two trials as dangerous "heroin use". It is that process by which a fraction of marihuana users become heroin addicts.

With regard to the use of cannabis by physicians and medical students, the Report complacently states: "Only seven percent [of physicians] reported current use [of cannabis] and, as expected, younger physicians and those living in New York City and San Francisco were more frequent users than those in the other areas." This is, in fact, alarming; for the effects of cannabis in persistently depressing memory and other mental functions can be expected to diminish the quality of performance of physicians. If seven percent of all physicians now use cannabis, while the use is "more frequent" among the younger ones, then the fraction of *young* physicians using the drug is large. Some surveys suggest that 50% of medical students smoke marihuana. The Report cites a study with only 50% response that showed one third of a group of physicians had tried marihuana, and one might suspect a higher fraction among the nonrespondents. The report minimizes the importance of this aspect of the problem.

The Report dismisses the studies conducted by Professor Soueif for the Egyptian Government in two short paragraphs. It fails to recognize the great significance of this work. These studies were carefully controlled; they focused on the persistent effects of cannabis and compared a wide range of social and achievement levels; they were conducted when the persons in the study were not acutely affected by cannabis; and they found a striking result: the higher the individual's original mental test scores, the more they were depressed by cannabis use. None of this is mentioned in the body of the Report. There seems to be an indirect reference to Soueif's study in the "Introduction," but only for the purpose of belittling its importance: "There is significant new evidence regarding the implications of long-term cannabis use. However, much of it is based on overseas populations quite different from an American user population both in their patterns of drug use and in the demands their society makes upon them. Moreover, ours is a society that makes simultaneous use of many drugs. They are used recreationally, as self medication and by prescription."

It would have been wise to point out that America probably demands higher average levels of mental performance than does the Egyptian society and hence that the damaging effects of cannabis use in American life must be greater. And the Report should not have lightly accepted the propagandists' cliché, "recreational use of drugs," and mentioned it so casually as a socially accepted practice. It tends to make drug use seem as "American" as going to a baseball game or eating apple pie.

Although a 4-page summary of the Soueif study is finally presented in the section on "Marihuana Use in Other Countries," I find it does not convey the sense of the paper or its significance. The text is merely full of technical details of methodology. It does not even mention Soueif's finding that the probability of hashish users becoming opium users was a function of the duration of their exposure to hashish.

The section on "Future Research Directions" is strong on sociological studies but weak on the biomedical side. It fails to emphasize the importance of investigating the extent of persistent effects of marihuana on mental function and possible brain damage. The decreased educability of chronic marijuana users has been observed, but further research into its causes and cure is essential. The Report seems to regard the genetic and embryonic effects of marihuana as a closed book, since no recommendation for future research on that aspect is offered. I believe there is enough evidence to call for a more extensive investigation of that effect.

Like the Shafer report, HEW's 1973 report on "Marihuana and Health" contains some impressive cautionary material in the larger text—which is somehow completely ignored in the summary of findings. For example, the HEW report, under metabolic effects, makes this statement:

"By using whole-body autoradiography and measurement of radiolabeled drugs in isolated tissues, it has been unequivocally shown that THC penetrates the placental barrier and accumulates in the fetus. . . . At high doses, the fetal levels become high enough, however, to cause embryonic and fetal deaths."

This sounds pretty impressive—however, none of this is reflected in either the two-page introduction or the six-page summary, which is what most people read and credit.

In other cases, the report glosses over recent research conducted by responsible scientists in the United States and abroad—or seeks to refute this re-

search by repeated references to the utterly worthless study conducted, under an NIMH grant, by a few Jamaican scientists of limited credentials.

While the report does make a brief reference to the research conducted by Dr. Stenchever and his colleagues at the University of Utah, which established that marihuana smokers, even at the rate of one cigarette a week, displayed three times as many chromosome abnormalities as non-smokers, it dismisses this extremely well-controlled study with the following words:

"There is no convincing evidence that chromosomal abnormalities arise from marihuana use. The Jamaican study of chronic users as well as other studies of the effects of THC on chromosomes in human lymphocytes (a type of white blood cell) indicate no changes related to cannabis use."

The report also completely ignored the most impressive neurophysiological studies yet conducted on the human brain and the brains of monkeys which produced electroencephalographic recordings demonstrating massive abnormalities in the brains of cannabis smokers, and persisting abnormalities after relatively brief periods of chronic use. This testimony was presented to your Subcommittee last Thursday by Dr. Robert Heath, Chairman of the Department of Psychiatry and Neurology at Tulane University. Again, the worthless Jamaican study is invoked as the supreme authority. This is what the report says:

"Systematic study of brain electrical activity (EEG records) in matched user-nonuser populations in both Jamaica and Greece have not disclosed abnormalities associated with cannabis use."

Perhaps not very surprisingly, the report fails to conclude that we are confronted with a national cannabis epidemic of a gravity that calls for an all-out effort of public education by the various federal, state and local agencies concerned with the problem of drug abuse. Without such a campaign, needless to say, it's going to be impossible to turn the situation around.

Despite the fact that it contains much solid scientific information, therefore, I would have to state, bluntly, that in my opinion those who compiled the report for the Secretary of HEW have been guilty not only of professional incompetence but of a major disservice to the people of the United States.

Question. You have spoken in a highly critical—I might say bitterly critical—manner about the Jamaican study which was quoted by the HEW report. Do you really think this study has had any serious impact on public understanding in this country of the dangers of cannabis use?

Answer. Let me first quote from an official paper on this research:

"Twenty-seven cultures from 12 users and 15 controls failed to produce adequate results for analysis. Either there was complete failure of mitotic activity or the quality of the cells was inadequate for examination. Part of this high failure rate was due to a bad batch of calf serum used in our culture medium. It is not known without repeating the examinations whether this was the only factor."

The above difficulties, acknowledged by the Jamaican study, invalidates the observations. For one thing, 12 users and 15 controls amounts to a large fraction of the study; for another, the admitted difficulty suggests that cell cultures in the defective medium appearing to have some degree of mitotic activity or "reasonably normal" cell appearance were accepted as part of the study. This kind of research difficulty would not be acceptable by experts in the field of chromosome studies; indeed, they would not have conducted any such study without being certain of the culture media and all other aspects of the test conditions determining the validity and the reproducibility of the results.

I believe that the Jamacian study—precisely because it was funded by NIMH and has now been given the apparent blessing of HEW—has already had a tremendous negative impact in the United States. It is being quoted over and over again by all those who are lobbying for the legalizatoin of marihuana. This would be bad enough. But the damage was compounded by an article in the popular medical weekly, *Medical Tribune*, in October of last year. I have brought a copy of it here with me.

The heading of the article reads, "Study of Chronic Use of Marihuana Demonstrates No Chromosome Breaks, Brain Damage, or Untoward Effects." Then the article says, I quote:

"A double-blind clinical study of the effects of marihuana in a sample of a population long habituated to its use has yielded no evidence of significant

physiologic or psychoneurologic differences between smokers and a control group of nonsmokers. . . .

"The results of this investigation appear to lay at rest many common beliefs about the deleterious effects of marihuana—beliefs based on laboratory observations (or anecdotes) of acute effects in haphazardly collected groups of study subjects, without regard for idiosyncratic physiologic differences or behavioral or sociologic background. . . .

"Abnormalities found in chromosome studies of peripheral blood cultures were slightly more frequent in the nonsmoker controls."

The article in *Medical Tribune*, not very surprisingly, was widely picked up around the country. An article in the *Detroit Free Press*, for example, carried a five-column head: "Study Finds Marihuana Not Harmful." Since I have already quoted from this article, I shall not repeat myself—apart from emphasizing that the article was not speaking of the occasional use of marihuana but of the chronic use of marihuana having no apparent harmful effects.

For these reasons, I believe that the Jamaican study has done tremendous damage to the cause of public education, and that the emphasis placed on this document by the recent HEW report has given major support to the pro-marihuana lobby in this country.

Question. Dr. Jones, how is your scientific research on drug abuse supported?

Answer. At present, not at all. When I first became involved, in 1965, I considered this research a side line. I read and analyzed the literature on the subject and began, in my spare time, to interview and study the characteristics and experiences of persons taking the psychoactive drugs. In 1967, I received a grant from the Carthage Foundation for a special study of Controversy in Science, and they allowed me to use a portion of it for my study of drug-affected persons. From the beginning, my research was directed toward determining long-term consequences of drug abuse and methods applicable to education in drug abuse prevention and in rehabilitation of drug-dependent persons. Almost immediately, I found significant leads in these areas, warranting expansion of my work into supportive laboratory research and clinical trials.

Question. Then you did obtain funding to enlarge your studies?

Answer. No, I did not. I have tried repeatedly to get such funds, both by formal application and informally, but I was always turned down.

Question. Can you tell us more fully about this situation and whether you have grant applications that are now pending?

Answer. Before answering your question, allow me to state that my appearance here as a witness has nothing to do with my disappointment in seeking Federal support and the handicap it has been to my work. I have no grant applications pending at this time and I have no plan to submit an application, as I will explain.

The funds from the Carthage Foundation were limited. From the beginning until they expired last year, we had agreed that I should apply for Federal funds, since very large sums were known to be available for drug abuse research and my studies were so promising of early practical results. When I did apply, however, I found the reviewers of my proposal were very antagonistic, and it was no surprise to me that my application was rejected. I know that my vocal and long-standing opposition to the "soft line" on marijuana and to the methadone program for heroin addicts has not helped to make me popular in some circles.

Question. Dr. Jones, from your continuing research, have you been able to make an estimate of the extent of cannabis use in the United States, and the trend? Could you offer an opinion about the information on cannabis seizures supplied by Mr. Andrew C. Tartaglino of the Drug Enforcement Administration?

Answer. Most of the data I have been able to collect indicate that the use of cannabis is increasing at an exponential rate—like compound interest—and that the outlook for the immediate future is further increase in cannabis use. In my opinion, it will continue to increase until the public understanding of the hazards involved is sufficient to discourage the use of marihuana.

Each year of the past decade, some authorities have stated that the use of drugs is declining; but overall, the use of both marihuana and hashish has been steadily on the increase. In the first analysis I made of this trend, in 1968, I used as the quantitative measure both the number of California juvenile drug offense arrests and the quantities of drugs seized. I believe the data supplied by Mr. Tartaglino are consistent with the present trend of increase in numbers

of cannabis users and increase in quantity of cannabis consumed by each individual—both in dosage per use and frequency of dosage.

The regularity of the tendency for the quantities of cannabis to increase with passage of time, from 1969 to 1974, is impressive. This is what would be expected in a country as large as ours, with many agents working on illicit drugs and with the separate seizures being relatively small in comparison with the aggregate totals for the year. I must emphasize the seriousness of the fact that all data I have examined on the frequency of use of cannabis by grade-school and college students indicate a steady increase in percentage using the drug, both by age and by grade. The Tartaglino data are in accord with these observations and should alert us to the increasing use of cannabis.

I have made a continuing survey of marihuana use among UC students since 1968. On the basis of my own data, I have made a graphic analysis of the trend of the Tartaglino data, as shown in the graphs which I am submitting for the record at this point.

TABLE I.—ESTIMATIONS OF NUMBERS OF CANNABIS USERS AND QUANTITIES OF THE DRUG CONSUMED (TABLE OF QUANTITIES OF THC CONSUMED BASED ON 200 U.C. MALE UNDERGRADUATES, 1973)

Frequency of use per week	percent	Assumed dose THC:mg/dose		mg THC, estimated smoked per 100 users		Estimated mg THC smoked per year per person
		smoked	absorbed	per week	per year	
7 or more	4	40	20	1,200	62,400	15,600
6 to 7	6	30	15	1,117	60,840	10,140
4 to 6	20	26	13	2,600	135,200	6,760
2 to 4	54	20	10	3,230	166,400	3,081
1 to 2	10	16	8	240	12,480	1,248
Less than 1	6	10	5	30	1,560	260
Total					[1] 438,880	

[1] THC equals 4.39 g smoked per year per male cannabis user.

[2] Seizures are estimated to be between 8 to 12 percent of the contraband. A conservative figure, therefore, estimating the total cannabis smuggled is to multiply Federal seizures by a factor of 8 (assumes 12 percent seizure).

[3] This is based on my interview data; approximately half of cannabis using persons grow their own or get their supply from someone who grows it.

Note: Estimated supplies of cannabis, United States 1973: Marijuana seized by Federal agents, 782,033 lb at 1.5 percen THC equals 11,730 lb THC times 8 [2] equals 93,840 lb; estimating domestic production [3] equals illegal importation of 93,840 lb; hashish seized by Federal agents, 52,333 lb at 10 percent THC equals 5,233 lb THC times 8 equals 41,864 lb; total THC consumed in 1973 equals 229,544 lb; or total THC consumed in 1973 equals 104,300 kg.

Total users in United States if pattern of use is like Berkeley, the average male user consumes 4.39 g THC per year. The average female user consumes 3.6 g THC per year.

Ratio, male to female users is 2 to 1; average user, male plus female, estimated to consume 4.13 g/yr. Therefore 104,300,000 g THC available in United States in 1973 divided by 4.13 g THC consumed per average user is 25,000,000 users. Of these, 10 percent or 2,500,000 use cannabis more than 6 times per week.

TABLE II.—DURATION OF MARIHUANA USE, 1973, U. C. MALE STUDENTS 18–24 YEARS OLD

	Percent		Percent
0	42	4 years or longer	23
6 months or longer	57	5 years or longer	12
1 year or longer	54	6 years or longer	3
2 years or longer	44	7 years or longer	2
3 years or longer	33	8 years or longer	.1

Note: Estimated year of onset of marihuana epidemic in these users—January 1966; average age then 14 years 9th grade. This estimate is based on a larger compilation of the data.

TABLE III.—FRACTION OF MALE STUDENTS REPORTING RECURRENT USE OF MARIHUANA, U.C. 1973

	Percent		Percent
Freshmen	20	Juniors	58
Sophomores	31	Seniors	90

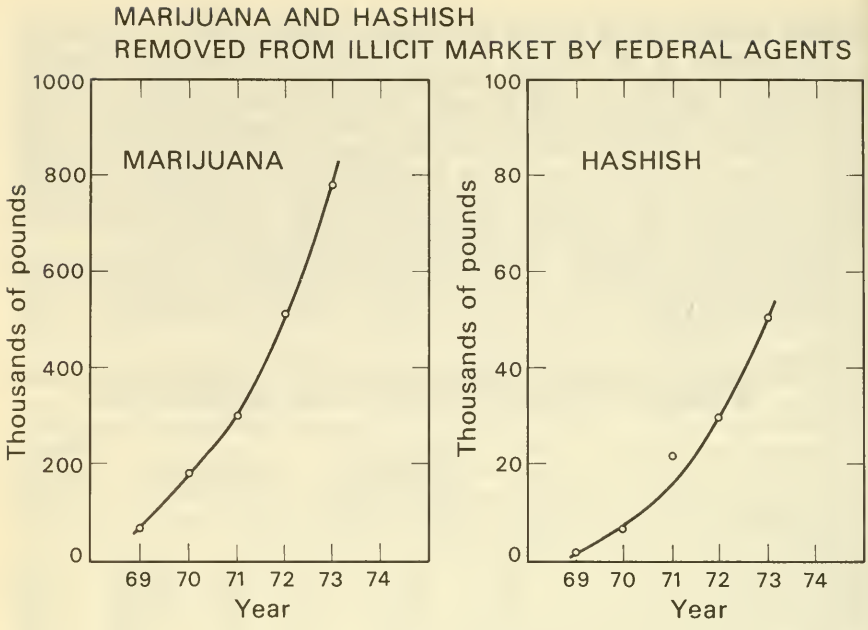

Fig. 1

Fig. 1.—Pounds of cannabis (marihuana, A; hashish, B) removed from the illicit market of the United States by Federal agents. The information is from the statement before the subcommittee by Andrew C. Tartaglino. Note the exponential increase from 1969 to 1974.

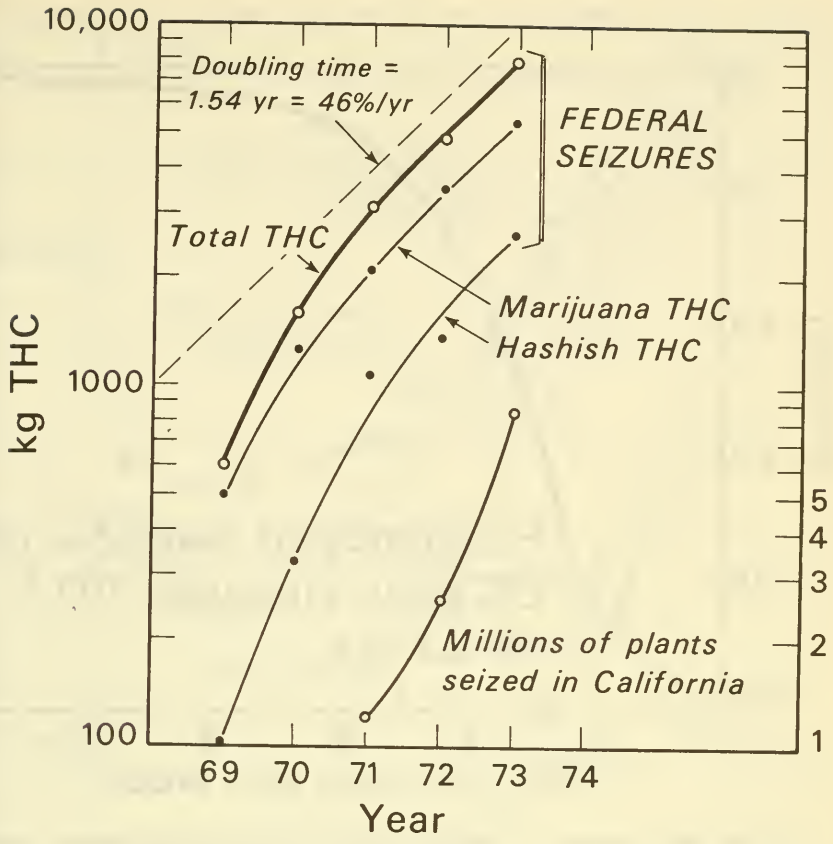

Fig. 2

Fig. 2.—Kilograms of THC in the cannabis seizures. Marihuana is assumed to contain 1.5% THC and hashish, 10% THC. The quantity of THC is on a logarithmic scale, and a line matching the most recent increase in THC is drawn for reference. Its slope indicates a doubling time of 1.5 years, or a rate of increase of 46% per year.

Fig. 3

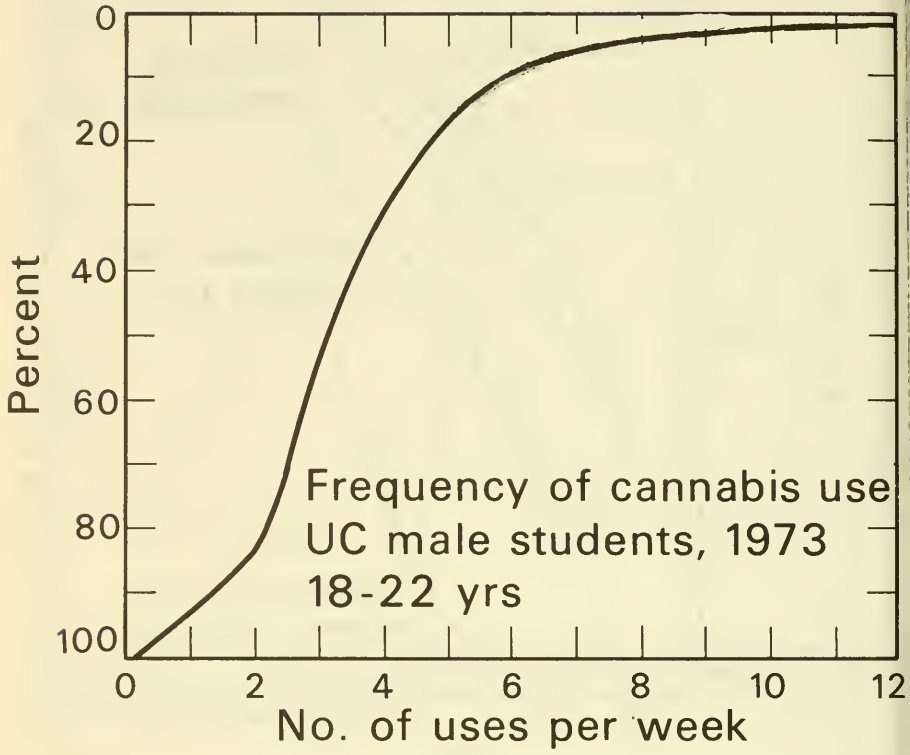

FIG. 3.—The frequency of cannabis use in 200 marihuana-smoking undergraduates, 1973.

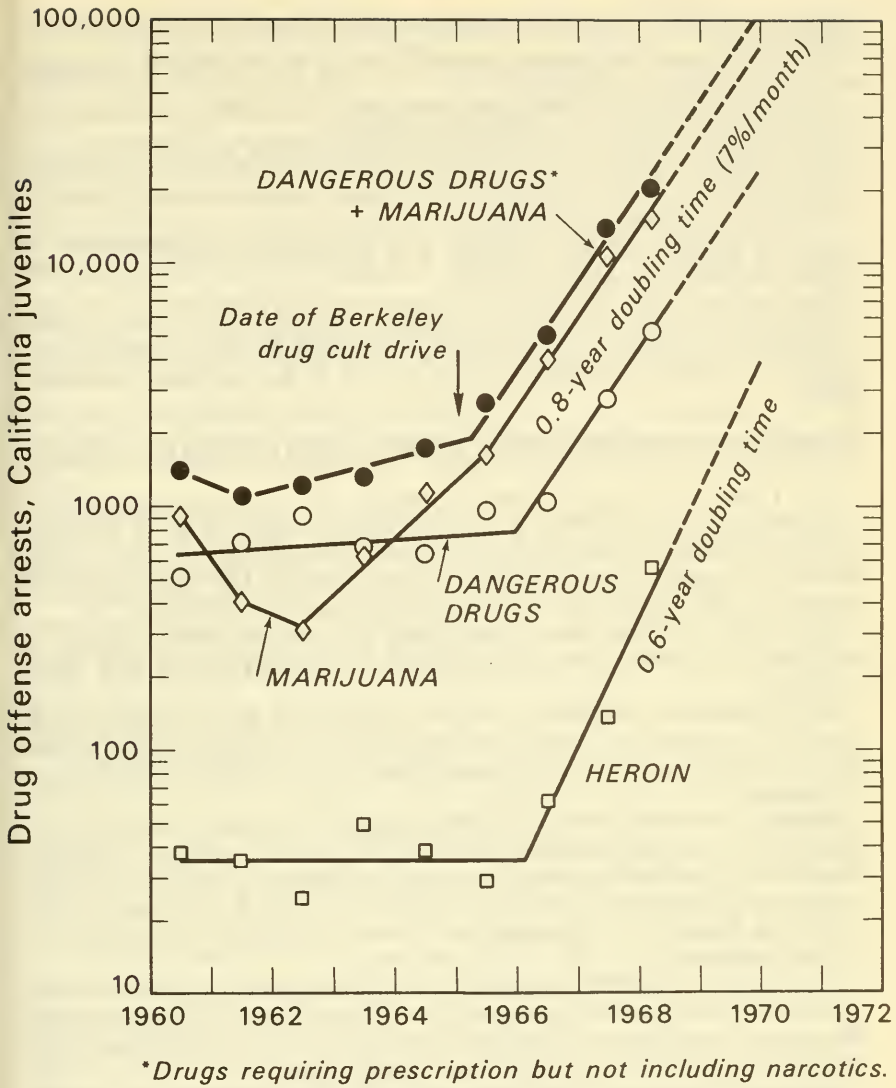

Fig. 4

FIG. 4.—Analysis of drug abuse trend (Jones, H.B., 1968). Based on California juvenile arrests for drug offenses.

List of Research Papers on Drugs Offered for the Record by Professor Hardin Jones.

1. "The Deception of Drugs" by Hardin B. Jones, Ph. D., *Clinical Toxicology*, 4(1), pp. 129–36, March, 1971.
2. "A Report on Drug Abuse in the Armed Forces in Vietnam" by Hardin B. Jones, Ph. D., *Medical Service Digest*, August, 1972.
3. "A Study of Drug Abuse and Its Prevention for the Armed Forces of the United States" by Hardin B. Jones, Ph. D., and Helen C. Jones. (A report on a worldwide study of drug abuse in the U.S. Armed Forces, conducted under contract for the Department of Defense.)
4. "The Effects of Sensual Drugs on Behavior: Clues to the Function of the Brain" by Hardin B. Jones. (Chapter 8 of PSYCHOBIOLOGY, Newton and Riesen, John Wiley and Sons, Inc., 1974.)

Mr. MARTIN. Our next witness is Mr. Keith Cowan from Canada.

Senator THURMOND. Mr. Cowan, it is good to have you with us. Will you identify yourself for the record and state your qualifications?

TESTIMONY OF KEITH COWAN, PRINCE EDWARD ISLAND, CANADA

Mr. COWAN. Yes, sir; I am an adviser to the government of the Canadian province of Prince Edward Island, director of an institute associated with the University of Prince Edward Island, and a member of the public drug education committee of the department of education. My presentation today is made as an individual.

My special interest lies in the field of communications which is applied in my work to the problems of drug education and labor relations.

My background includes a honor's premedical science degree from McGill University in 1940, and several additional years of night and day university work in the humanities, labor relations and communications.

Twenty-five years of work has been spent in industry, the information media and government, including 8 years with the Economic Council of Canada and the national productivity council, during which time I prepared a 2-year study on the "Role of Communications and Behavioral Knowledge" for our National Commission on Labor Relations.

Mr. MARTIN. Mr. Chairman, I believe Mr. Cowan will have to abbreviate his statement considerably in order to get through in the time remaining to us. May I suggest that the entire text of his statement be incorporated into the record as though read.

Senator THURMOND. Without objection, that will be done. Mr. Cowan, your entire statement will appear in the record as you have it prepared.

Mr. COWAN. Thank you.

Senator THURMOND. And then counsel will propound questions to you to bring out certain points, and anything that you feel in addition, if you could do it.

When I have to leave to vote I will ask counsel just to continue the hearing in my absence.

Mr. COWAN. General interest in drug abuse issues began with our children's university years both in the United States and Canada in the 1960's when drugs on the campus became a public issue and a natural concern of parents.

A special interest in cannabis started 4 years ago when my cabinet minister, the late Hon. Elmer Blanchard, our Province's Minister of both Labor and Justice, asked if I could help him prepare a statement to be presented to our National Commission on the Non-Medical Use of Drugs, which is popularly known as the Le Dain Commission. The Ottawa government had invited each provincial government to give its views at the open hearings of the traveling commission. Prince Edward Island was the only province which responded.

What began as a request for a "little" time has instead become a continuous part of my work and concern to this day, touching persons and organizations in several countries. My various responsibilities over several years have permitted numerous visits to the United States which made direct personal contacts possible with administrators, deans and students at many American universities and research centers investigating cannabis problems. This added greatly to phone and mail exchanges and information from literature, providing data for my presentation today on "Cannabis and the Communications Gap."

When the poet suggested that "ignorance is bliss" he could not have been aware of today's vast and, I believe, dangerous communications gap on the subject of the harmful effects of marihuana and hashish.

Evidence is mounting in Canada and the United States that huge numbers of youth at increasingly lower age levels in schools and neighborhoods, many young professionals and important press and other media accept cannabis as a basically harmless recreational drug which should be as available as alcohol or tobacco. The evidence of these hearings warns us to the contrary.

It is clear from my work that this "benign" image is one of the major causes of the drug's wide acceptance and use. Therefore, Mr. Chairman, your subcommittee of the U.S. Senate deserves high commendation from within and without the United States for bringing together thoroughly qualified medical researchers from around the world to testify in public hearings in order that carefully prepared evidence might help to close such a serious gap in public knowledge.

You have heard from recognized authorities at these hearings of specific and serious problems which arise from the steady use of marihuana and hashish, such as long-term retention and accumulation of cell-interfering chemicals in the fat cells of the brain and reproductive organs, significant chromosome breakage and DNA damage, serious immunity and hormone interference, traffic dangers, reduction in the abilities of the higher levels of the mind such as memory, intellectual capacity, coordination, potential irreversible brain damage and so on. Some of the evidence has only become known in the last 2 years, but strong warnings have been available for many years as clinicians had observed harmful effects without knowing the how or why.

In spite of such evidence, pressures are being exerted on Western World governments to take irretrievable steps towards the legalization of cannabis products, perhaps more fiercely in the United States than anywhere else. While the governments of Great Britain, France, and Canada have made firm decisions to hold the line on any spread of the drug through heavy legal penalties for trafficking and con-

tinued but reduced penalties for possession. public evidence of pressures on American State, civic, and Federal governments has given Canadians concerned with the problem, considerable anxiety due to the lengthy common and friendly frontiers. Drug traffickers recognize no custom barriers.

What gives these political pressures credence, is the general communications gap particularly among the youth.

A few illustrations of this gap may suffice.

The most recent have come to my attention since arriving in Washington to attend these hearings. Two young men visiting from Detroit, Mich., dropped in on the first hearing. Afterward, one of them, a teaching assistant, wanted more information since he seriously questioned the evidence of harmful effects which he had heard for the first time. He announced that he enthusiastically supported the drive to "decriminalize" marihuana. He said that he had read the National Commission report, the books of Dr. Grinspoon of Harvard and knew of the work of the organization called NORML—National Organization for the Reform of Marihuana Laws.

"What evidence have you read of the harmful effects of the drug?" I asked. "Well," he said with a puzzled look, "I haven't read of any serious problems." The other youth did recall having seen one item about hormone damage in a recent Detroit newspaper.

The almost closed mind of the first youth, a teacher who had done some reading and research, and his apparent missionary enthusiasm to liberalize the use of cannabis as a harmless drug is a common phenomenon.

In the last few days I also met a well-educated, highly intelligent Washington couple from the business community with children in the young teenage bracket. When I told them of the evidence presented to this hearing, they were greatly incensed because they had not heard of it before. "We have been trying to find out something authentic about this drug without success," said the mother. She knew that the drug was being used in the neighborhood and wanted to discuss the question intelligently with her children.

A local university dean told me last week that, with virtually no evidence to place against his children's reading and the accepted belief among their friends, he had very great difficulty making a case to discourage them from using it.

A responsible Washington public official informed me that he finds the young college person coming onto his staff generally favorable to the open use of marihuana and disdainful of any harmful effects.

A relative of mine from the State of Washington reports that her son's high school teacher told the clas during a drug education program that marihuana was the only drug for which she had no adequate information.

A quiz conducted in a Texas high school showed that out of a class of 25, only two students believed that any harm could come from using marihuana, and neither of the two could describe any specific difficulties.

Last year, a University of Michigan team conducted a high school, classroom drug education program, in which the pro's and con's of marihuana, tobacco, alcohol and one or two other drugs were listed

on the board, side by side—without any judgment or evaluation. It was found, however, that the use of marihuana increased significantly following these presentations. I phoned the professor in charge, and asked if certain of the information which has been presented in this hearing and was then available had been listed among the harmful effects of marihuana. "No," was the reply. From the manner of presentation, in my analysis students could see no basic difference between tobacco, marihuana and alcohol. And since they themselves had tried or were using alcohol and tobacco, along with most of their parents, it seemed reasonable to use pot as well.

Discussions with a cross-section of people from many parts of Canada and the United States over the past 3 years, including meetings with groups of students, confirm the impression that a belief in the essential harmlessness of marihuana is a widespread viewpoint, especially at school and university levels.

Last month, I sat in a gathering of Canadian high school students from a fairly large area. They were frank about the growing use of cannabis in lower grades and the fact that general opinion in the schools favored the legalization of marihuana because it was harmless.

Knowledge about this communications sickness was sharpened when I recently met with educational officers from Canadian drug addiction organizations. When I presented a summary of the evidence you have been hearing, the majority of those present were either startled that such information existed or attacked the information as inaccurate, as yet unproven, or highly biased. A representative of Canada's largest drug addiction organization reported categorically that his group were "less concerned" about marihuana and its effects than they had been 5 years ago. The second largest organization suggested that they had never been given any evidence to be concerned about by the universities upon whom they depended for information.

Even more disturbing is the report from Canada's Toronto Globe and Mail of December 21, 1973, on a new study conducted by the Ontario Addiction Research Foundation which shows that high school teachers tend to be more favorable to the legalization of marihuana than students. The more the person knows about the drug, according to this research, the more permissive he or she becomes and, of course, teachers had read more than their students. Assuming some accuracy in this study, the question we must ask—as I did of the youth from Detroit—is, "What has been read by the teachers of this continent and all the others to produce such a favorable attitude to legalization?"

During the last 3 years, the national press of Canada and, as several witnesses have reported, the U.S. press as well, has almost totally emphasized the harmlessness of cannabis. Some encouraging changes have begun, however, in the past 6 months, I am pleased to report.

To illustrate the problem, last September 25, Canada's largest newspaper, the Toronto Globe and Mail, ran a lead editorial on the excuse of the announcement by a Toronto dentist who claimed that regular marihuana smoking seems to keep teeth clean—so might nitric acid. The editorial totally exonerated the drug from causing any medical problems. The real and only harm came to youth because of

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breaking the law. And in any case, the editors suggest, doctors, lawyers, university professors, et al., are now using the drug. By inference, "let's get on with it," and smoke up.

One month earlier, the same paper carried a full-page review of the U.S. Consumers Union volume "Licit and Illicit Drugs" accompanied by color drawings and a headline entitled, "Are Laws More Damaging Than Drugs?" emphasizing, with faint criticism, the book's theme and the policy position of the Consumers Union, namely, that penalizing laws for all drugs, including heroin, rather than the drugs themselves, had caused the most damage to society and individuals. To the layman, says the paper, this book is "most convincing" and from a "long respected source," adding that the Consumers Union expects that the book "will have a great impact on public policy."

Again, on February 12, 1974, a three column story on cannabis research in Ottawa Laboratories plays up a "research student's" comments—made while rolling a joint for himself—that he had become convinced marihuana was "less harmful than alcohol or cigarettes" and should be legalized. More cautionary comments from the professional researchers themselves were buried in following paragraphs.

A similar pattern is evident in the American press. The New York Times, which has an important Canadian readership, used to give good space to news critical about marihuana. This has almost stopped dead for the past few years. Not one word on these hearings, for instance. While the Washington Star-News carried an excellent story critical of cannabis following the opening day of these hearings, nothing appeared in the Washington Post until 2 days afterward when a four column, well-displayed story written by Tom Braden appeared on the editorial page of May 11. Its title, "Slow Progress on the Marihuana Front" was set off by a sizable picture of police officers in a marihuana patch. In telling of changes in States laws to reduce penalties for marihuana use, the article claimed that "no respected body of opinion any longer holds that moderate consumption is any more dangerous to the human body than consumption of tobacco or alcohol"—a fallacy that is contradicted by the evidence presented at these hearings.

Nothing appeared about the evidence from the hearings during the next few days in the Post, even though one of its writers had tried to contact one of the witnesses by long distance phone before he came to Washington. The Post of May 17, which came immediately after the revelation before this committee of the high probability of brain damage and cancer resulting from pot use, not only carried no story, but carried six other well-displayed items on health and drugs, covering about 140 column inches.

The Washington Post has a great impact outside your country because it is quoted extensively in other papers. Intelligent readers in other countries rely heavily on quotes from the Post for information about the United States. The Post also commands special interest because of its reputation as a paper which is continually attacking coverups, or what it believes to be coverups. The Post has the right, of course, to publish Mr. Braden's profoundly mistaken column on

marihuana—even though columns like this encourage young people to experiment with pot and then go on to become regular users. But was the Post not guilty of the kind of coverup it denounces so regularly when it decided—and it could only have been a deliberate decision—not to report on these hearings? Their decision to ignore the hearings was all the more difficult to understand because of the international eminence of the scientists who testified, because of the newsworthiness and public importance of the research on which they reported, and because of widespread public and family concern over the issue.

Hopefully, the publishers and editors of the Post will reconsider their attitude, and will take the time to examine the scientific findings on cannabis presented to the subcommitee and then make this information available to their readers. This is something that their readers have the right to know.

The sad truth is that highly important and cautionary evidence has been available for years in the literature and in the experience of prominent medical men who have treated cannabis habitues. But it has not reached our youth and the public in any effective way as yet. Neither the United States nor the Canadian national commissions have succeeded in this vital educational job. In the United States, the report of the National Commission on Marihuana has been interpreted as providing a green light to the eventual legalization of the drug. In Canada, the Le Dain Commission's final cannabis report contains important cautionary material, but, perhaps due to the Commission's split decision, it has not deterred large numbers of Canadians from believing otherwise.

On a recent trip to England I searched bookstores associated with the University of London and the University of Oxford. Excepting one book, the only books openly available gave cannabis a basically clean bill of health. One document stated succinctly that science had not established that marihuana was as harmful as tobacco. Another book, prominently displayed at London hotels and tourist bookstalls for the more adventurous youth who were seeking "underground London," gave a full chapter to disproving any harmful effects and suggested that a secret British commission had cleared the drug for legal use, but the Government was afraid to make it public for political reasons. I learned, officially, that such is not the case.

Visits to five other universities on the U.S. eastern seaboard brought the communication gap home even more seriously. In one major university, I thoroughly investigated the literature in the bookstores, and every single drug study was favorable to cannabis. The dean of students told me that while they were observing ill effects on students using the drug in increasing numbers. they had no confirmation in the general literature to support their observation, and were therefore silent. Comments from several knowledgeable observers of campus life suggest that students on this continent will find almost all readily available books lacking in suitable cautionary material at their campus book shops.

Time has permitted a visit to only one Washington bookstore. A careful look at all books on display for sale on drug problems revealed that only one book detailing effects of popular illicit drugs

was available—a Ford Foundation sponsored study dated 1972 in which a Dr. A. T. Weil categorically states that cannabis was the only common drug which has no significant physical or mental harmful effects. Technical books have also been at fault.

In the summer of 1973 a scholarly article appeared in the U.S. "Journal of Drug Issues," written by three up-and-coming minds in the legal profession, all holding significant posts, one a Canadian. It proposed that cannabis be removed from international restrictive legal controls. Why? Because, and I quote, "The assumption that cannabis has significant inimical effects on the user and the society in which he lives was the reason why cannabis was subjected to the controls of the United Nations 1966 Single Convention. Inasmuch as this assumption has been contraverted by a number of comprehensive empirical studies, and because no evidence has offered to substantiate such assumptions, it appears the raison d'etre for subjecting cannabis to international controls is lacking."

The findings of four major national commissions were used as prime supporting evidence—the British, United States, Canadian, and Dutch Commission.

The study seriously erred in failing to mention the cautionary warnings from the United Kingdom, United States, and Canadian Commisison reports. It has been parlayed around government justice departments for serious study I am informed.

Last week, the executive committee of the Illinois Bar Association voted to recommend the removal of all penalties for possession and use of marihuana. On inquiry, Malcolm S. Kamin, chairman of their Individual Rights Committee reported that the organization NORML had encouraged this move by informing his committee both in person and by literature that marihuana was no more and probably less harmful than tobacco or alcohol and on this evidence, with none other available, the decision was made.

Mr. MARTIN. Could you define NORML for the subcommittee?

Mr. COWAN. Yes, it's the National Organization—I get confused with all these various long names——

Mr. MARTIN. National Organization for the Removal of Marihuana Laws?

Mr. COWAN. It's the Repeal of Marihuana Laws; it's the word "repeal" that I was trying to recall. I am so used to using the short form.

Mr. Kamin said it was a personal presentation and the evidence which they provided which gave the Illinois Bar Association the position which they accepted, that this was a basically benign drug, probably less harmful than alcohol or tobacco, in the words, "In the lack of evidence to the contrary" they of course accepted that position. He has asked me for material. I followed it up because it seemed to fit in with this material.

(Regarding the United Kingdom, United States, and Canadian Commissions, all were agreed in cautioning against the nonmedical use of the drug.)

A slick paper medical handout supplied free of charge through the mails to American doctors called "Medical Economics," carried a 19-page special feature entitled "Learning to Live with Drug Abuse" on May 28, 1973. It suggests the Shafer Commission has said what

everybody has known for years—namely, and I quote, "for most people, based on what we know, marihuana is a relatively safe drug." In a headline it also says "Decriminalization laws are giving young people assurance that marihuana isn't so bad after all." Decriminalization—with eventual controlled legalization like alcohol—comes through as the recommended way of the future. No mention is made of any of the serious effects being considered here.

The promotion and massive distribution of books favorable to marihuana by the organization NORML and other similar groups, as well as the Consumers Union, adds to the availability of pot permissive literature everywhere.

Evidence has also been given previously before the commission on the disproportionate amount of time TV has given to promarihuana sympathizers.

A brief look at the Theory of Communications may help to understand the communications gap phenomenon.

Communications Theory suggests that each person in the process of either sending or receiving messages from or to another person tends to either block or alter these messages through a variety of filters or altering devices built into the human system. Years ago, Walter Lippman, brilliant American journalist and philosopher, described the No. 1 human filtering device in these words: "The images in our head and the reality in the world around us."

The "image' of cannabis which we hold in our heads becomes critical, for we will normally view facts about cannabis according to that image. It is easy to visualize how our Detroit teacher had read certain books, reinforced by newspaper stories, the comments of friends and peers and because of the slowness of the drug to cause visible harm found it easy to develop a benign image of Cannabis—which tended to filter out negative information about cannabis.

Until the late 1950's, marihuana was little used in North America, feared as a drug of immediate and terrible consequences to human health and sanity and was placed under the heaviest penalties of our narcotics laws. The Dr. Tim Leary's, some early research, and other writings destroyed the validity of the "terror" image. "Scare tactics" were condemned. The removal of fear was unquestionably a prime cause of the drug's immense immediate spread. We had to ask ourselves in our pre-Le Dain analysis on Prince Edward Island, however, "did it follow that a proper removal of the terror image necessarily permitted the substitution of a benign image implying full legalization and open public availability?"

The filter of Values and Concepts is also important:

Four years ago our Minister of Justice and our Cabinet had to face the values to be used in making a decision about cannabis before the presentation to the Le Dain Commision.

It was ascertained from reliable medical authorities that clinical observations over a long period of time had shown up, certain possibly, serious harmful aspects of cannabis use which modern research had not yet verified. From his value system, the Minister reasoned, the role of a government is to take responsibility for the overall social health and well-being of the community—concerns regarding pollution and thalidomide, are examples. Looking back over the contro-

versy, it is pleasant to read the final Le Dain "cannabis" statement 3 years later, in which four of the Commissioners agreed on the concept that "harm is the most useful criterion for social policy" (p. 265), either to self or to society.

These clinical observations would have to be taken seriously until such time as medical research had clarified their seriousness. Clinical observation, we were instructed by our medical advisers, is an important tool of medicine.

Therefore, said the Minister in his presentation, "We strongly condemn any move by this Commission to recommend, or any move by the Federal Ministers of Health or Justice, to legalize or liberalize the use of marihuana at this time, as a betrayal of the trust which the people of Canada have placed in you, and a betrayal of the social, medical principles under which other drugs are abruptly removed from the market, when only preliminary research has indicated possible human danger" . . . "far more research is needed before any liberalization could possibly be considered," he added. In short, when warning flags are up, "A drug must be considered guilty until proven innocent," the title of our second brief to the Le Dain Commission given by the suceeding Justice Minister of P.E.I., the Honorable Gordon Bennett.

Concepts and values also played a role in the legal problem. Society is always endeavoring to solve the equation between total personal freedom and the need for order. I can only be free to the point where what I do unduly interferes with another person's freedom and vice versa. We legislate both protection against undue interference from each other and human rights together.

Therefore, the Minister, backed by the Cabinet, not only called for continued restrictions but also for a reduction of penalties for mere possession—no jail sentences for first and possibly second youthful offenders, with the removal of a criminal record after 2 years of good behavior. In operating the law, he added, youth should nevertheless come to understand that this is a "no-nonsense matter."

It was a plea for time to establish the validity of the warning signs. We have some evidence that P.E.I.'s plea was heeded in high places, even if only dimly in the Commission's Interim Report.

All of the above, of course, places a high value on the worth of the individual.

The second filter is emotion. If I dislike or fear someone or something I tend to pass along selected information which supports my fear. And worse, I filter out facts which don't support my dislikes. The opposite follows. A young adult who has developed a desire for the pleasure of the marihuana or hashish high, whether it be physical or psychological, will filter out information which threatens his pleasure and probably let it influence his judgment, say, if he is in the news media. England's Dr. Fairbairn told me of a recent visit to Greece, where he observed incapacitated "hashaholics" who became quite violent if any move was made or threatened to cut off their supply of hashish.

The third filter of importance is that of objectives or goals. If you have committed yourself to an evening out with the boys, or a day off on the golf course, you will find how readily you produce supporting evidence and reject facts threatening your goal.

Considerable numbers of determined individuals, some professionals, and a few well-organized, seemingly well-financed groups, especially in the United States, are bent on an all-out campaign to achieve the goal of legalizing cannabis, either through full-scale, alcohol-type distribution systems or by a process of de facto legalization by removal of all legal penalties for use and minor distribution. Journalist Edward M. Brecher appears to reveal the true goal or expectation of full legalization while promoting a de facto program in his report "Licit and Illicit Drugs," of the Consumers Union in these words, "One step short of legalizing marihuana would be the abolition of all penalties for possession * * *." When there is a determination to legalize or decriminalize marihuana, writers, leaders and followers put this communication filter to work. An organization based in Washington, D.C., called the National Organization for the Reform of Marihuana Laws better known as NORML, seems to be the most powerful. It puts out full page ads in magazines soliciting support. The ad is clever, misleading selection of data from the U.S. National, or "President's" Commission Report on Marihuana designed, of course, to support their goal. Four so-called myths are listed, and then denied in selective quotes from the Commission document under the title "Fact." For example:

The myths are 1. "Marihuana leads to heroin," 2. "Marihuana use causes crime and aggressive behavior," 3. "Marihuana is addictive," 4. "Marihuana users are societal dropouts."

In each case the answers leave out important qualifications which are contained in the Shafer Report.

Shafer said, for example—

> The fact is apparent that the chronic, heavy use of marihuana (1) may jeopardize social and economic judgments of the adolescent and (2) on the basis of past studies . . . seems to constitute a high-risk behavior, particularly among predisposed adolescents.

In conclusion it reads, "The incidence (of this behavioral pattern in the U.S.A.) is too frequent to ignore." The Report also calls for discouragement of the drug's use in strong words and for more effective measures to prevent its growth and all trafficking—both omitted from NORML's ad.

Unfortunately, the manner in which the staff of the Shafer Commission has placed the words and paragraphs together in their first report is either a communications stupidity or it is a calculated effort to distract attention from the report's strong cautionary language which Dr. Henry Brill of the Commission has reported here was the true intention of the members of that body.

Since the goal of the NORML group is avowedly to lobby against criminal penalties for marihuana use, and to work for the same kind of Government controls that are used on alcohol—Medical Economics, May 28, 1973—it would be natural to expect them to filter out information which would interfere with their goal achievement—such as harmful effects from marihuana use—and to promote favorable information.

Part of the funding which NORML achieves from the sale of its promotional literature, as well as from the Playboy Foundation, was used to buy the rights to the old 1936 antimarihuana movie "Reefer

Madness" which is now being shown up and down the campuses and schools in Canada and the United States.

The film is a horror-type documentary suggesting instant madness from the use of one joint of marihuana. The kids come and laugh themselves hoarse because the reality of smoking the drug, at least in the early stages, seems to them to have no bad effects—only pleasure.

In a subtle way, however, the film reinforces the benign image filtering mechanims, so that a person becomes more and more immune to believing negative facts about the drug. "Scare stuff" say the kids—if you don't put your truth effectively.

NORML also supplies a regular team of spokesmen for seemingly every state or civic hearing on legal changes or court trials.

One would also have to ask what were the objectives, or communication filters, of the National Coordinating Council on Drug Education in Washington, D.C., when a recent issue of its National Drug Reporter lists available study material and includes all of the favorable marihuana texts but makes no mention of cautionary writings such as the works of Drs. Nahas, Bloomquist, Louria, Paton, Mechoulam, et cetera.

Possibly the most serious distortion has been committed in Brecher's "Licit and Illicit Drugs." On what can be demonstrated as erroneous and incomplete information, the highly respected Consumers Union executive which sponsored the study, recommends "immediate repeal of all Federal and State laws governing the growing, processing, transportation, sale, possession, and use of marihuana," in an accompanying commentary.

Brecher used as his chief source quoted references from Le Dain's first "Interim Report." He draws vital conclusions, suggesting that they are implied in the "Interim Report." The final Le Dain report "Cannabis," however, directly contradicts Brecher.

For example, "Licit and Illicit Drugs," drawing from the Le Dain "Interim Report," claims for marihuana that

1. it is not addicting; 2. it is tolerance-free; 3. its physical dependency reports are suspect; 4. its short-term psychological effects are slight, and have little clinical significance; 5. it has little toxicity with overdoses; 6. its stepping-stone-to-other-drugs theory is erroneous; 7. there is no evidence of lung cancer.

And summing up, "with respect to psychoses and other adverse psychological effects . . . the Le Dain report is on the whole quite reassuring."

Le Dain's final report contradicts or heavily qualifies each of these statements, for example:

> The effect of cannabis in the mind is a potent one.
>
> It is not unreasonable to assume that persistent resort to cannabis intoxication may produce changes and impairment of will and mental capacity . . . (the) result of some biochemical effect. . . .
>
> We believe that by stimulating a taste for drug experience . . . cannabis must be reckoned as a potent factor contributing to the growth of multi-use drugs.
>
> What has come to our attention with respect to long-term effects since the Interim Report is a matter for cautious concern rather than optimism.

On lung cancer, Le Dain suggests that it is "not an unreasonable possibility" while also admitting the "possible effect on chromosomes and human foetus."

"Licit and Illicit Drugs" also puts forward the claim that:

Marijuana is here to stay. No conceivable law enforcement program can curb its availability.

Prohibition does not work.

A law enforcement policy that converts marihuana-smokers into LSD or heroin users should be abandoned.

While Le Dain's majority finding in contrast agrees that:

In our opinion, these concerns justify a social policy designed to discourage the use of cannabis as much as possible.

The state has a responsibility to restrict availability of harmful substances . . . and that such restriction is a proper subject of criminal law.

A policy of making cannabis legally available under government controls would increase, rather than reduce availability. . . .

And finally, there is "no doubt that criminal law creates risks for the trafficker."

No possible excuse can be made for Brecher's failure to notify the Consumers Union of the contradicting evidence provided in the final Le Dain report, when he used the Le Dain Interim Report for his source of knowledge.

Nor can the Consumers Union be excused for failure to draw attention to the Le Dain conclusions and to the new, completely contradicting, evidence in ensuing monthly issues of their Consumer Reports which carry large advertisements for "Licit and Illicit Drugs" and are available on most Canadian newsstands. A request to the Consumers Union by last year's president of the Canadian Medical Association, Dr. Gustav Gingras, for such printed corrections in order to undo the harm caused to readers of this misleading book, was flatly refused.

OTHER GOALS

Evidence is accumulating on what I believe to be a relatively small number of people whose goals are not based on misconceptions about the harmful side of marihuana. How much influence they have, no one can say, but their efforts cannot be entirely neglected. One element openly seeks an overthrow of present society, and announce that pushing drugs is an integral part of the program. The Le Dain hearings produced evidence from one young witness that he and others intended to use drugs to destroy society, but it would probably be necessary to correct the drug program and its damages after they had succeeded.

The "Weatherman" group in the United States has issued bulletins suggesting that "grass and the revolution are inseparable." And "The Brotherhood of Eternal Love" established by Dr. Tim Leary for the avowed purpose of societal change are thought by international police forces to have been the world's largest manufacturers of illicit LSD. A number of people identified with their organization have been apprehended by police in the past several months with large quantities of hashish in their possession.

Cash profit can also be a motive for information distortion. One prominent doctor told me that a cigarette manufacturing company had approached him to ascertain exact knowledge about marihuana. That company became convinced of its harm. . . . What about others, or less reputable groups attracted by the rewards from big time

trafficking. Many youth have also found the sale of marihuana in small lots financially rewarding.

It may be of interest to note that in Canada, a Commission on Youth under the Secretary of State turned out a document in 1971 for national distribution calling on the government to legalize marihuana for everyone over 18 on the grounds that "soft drugs are relatively harmless, or at least, so they seem in the absence of any conclusive medical evidence to the contrary." Fortunately, prominent Canadian medical men and the Canadian Medical Association had strong words to say to the government about this misleading claim.

Strangely, a committee at the National Y.M.C.A. headquarters turned out a newspaper for distribution to youth from each "Y" across Canada calling on young people to study the Commission report, referring specially to the marihuana recommendations. They asked youth to make their voices heard in parliament on the issue. Fortunately, wiser heads prevailed.

The methods of the pressure groups sometimes raise serious questions:

SANE, short for "Committee for a Sane Drug Policy" of Boston, Mass., joins NORML in reaching out to knock down any opposition. When Dr. Nahas appeared before a committee of the Massachusetts legislature considering the reform of marihuana laws last year, this organization filled the hall with supporters and presentations. Dr. Nahas, almost alone, presented the other side, based on research evidence. He was publicly attacked as "irresponsible," by NORML adherent and SANE cooperator Dr. Grinspoon.

Recently, while in England, I was shown the June 1973 issue of a monthly English bulletin called Drugs in Society, which carried a brief account of Dr. Morton Stenchever's discovery of chromosome breakage at the University of Utah. In the issue for the following August, I was shown a written personal attack on the integrity of this highly qualified scientist written by a Marsha Semuels of Boston, who signed herself as "coordinator" of SANE. Dr. Stenchever was charged in her letter with not being a pharmacologist, nor a medical researcher, but a teacher of gynecology "whose study had not been published," and in the writer's own words "probably never will be." "What has been reported as scientific evidence," she adds, "is merely a speech the doctor made at a conference. It cannot, therefore, be taken seriously."

I, too, had talked and corresponded with Dr. Stenchever, and as you heard last week, he has conducted extensive research for years, advanced genetics is his scientific discipline and his study did appear in The American Journal of Obstetrics and Gynecology of January 1974.

Under severe attack for his work, however, the doctor briefly considered giving up the project rather than become involved in "political" issues. Vicious letters and phone calls, questions from those financing his research, a bitter attack in the college newspaper by its editor, came close to stopping this important research, which others, once tipped off, have now confirmed.

The attacks on Dr. Nahas have been equally vicious. Following the publication and press release of his immunity damage studies on

January 25, 1974, K. Keith Stroup, director of NORML, wrote a letter on February 2 to the Columbia University student newspaper, the Columbia Daily Spectator which was published February 22. After quoting a review criticizing the methodology of Dr. Nahas' book "Marihuana—Deceptive Weed" by a pharmacologist in the Journal of the American Medical Association, Stroup quotes from a review in the New England Journal of Medicine which calls the book filled with "half truths, innuendo and unverifiable assertions." Stroup neglects to mention that the author is Dr. Lester Grinspoon, prominent member of NORML's advisory board, who is then quoted directly when he calls Nahas' work "psychopharmacological McCarthyism."

Stroup includes, as well, a quote from Dr. Norman Zinberg, also a NORML board member, which calls Nahas' work "meretricious trash," and done by a man who is "solely and cynically interested in picking up a few bucks by playing on the public's enormous concern about drug use."

Since none of the national commissions reported similar finds, states Stroup, nor is it seen in clinical evidence he claims, Nahas must be dismissed as a man who "favors treating marihuana users as criminals" and whose attitude as well as his study is based on "self-righteous fanaticism."

Stroup has erred in failing to mention that Canada's Le Dain Commission did foresee the possibility of future chromosome damage and it must be noted that the attack is based on the Nahas book, not the research paper. On a much more serious point, we must ask why a "responsible" body concerned about the well-being of humanity should not first seriously examine the actual full detailed facts of the Nahas research, its procedures, et cetera, in the light of the harmful implications to health and future generations should his findings be accurate—instead of attempting the character assassination of the man.

No full detailed criticism of the extremely careful research done by this brilliant team from Columbia, which includes Dr. Morishima who testified here last week, has been done by NORML or the medical reviewers mentioned.

Stroup sent an additional, even stronger letter to the dean of Dr. Nahas' department at Columbia, in a further attempt to discredit him. It was, of course, ignored, I am informed.

Attacking the man personally and not his actual work raises questions about the attacker and has no role in science.

I would also like to mention that the Science Editor of the Associated Press in New York received an anonymous phone call on January 24, 1974, just before publication of the Nahas study suggesting that the press story should not go out the next day since the work was garbage and at least one of Dr. Nahas' team intended to publicly break with the work because of his disgust with its inadequacy. The caller was ignored. His facts were wrong.

I have presented evidence on certain American books, organizations and newspapers since many American journals and other printings are widely distributed and read in Canada and influence Canadians as well as Americans.

Therefore. I hope very much that authors Grinspoon, Zinberg, Goode, and NORML and the Consumers' Union, will examine this new scientific evidence without delay. I am confident that they will find it convincing. When they do, I hope they will move immediately to give this information the wide public recognition it deserves—so that hundreds of thousands of young people on this continent who had believed their earlier statements about marihuana—statements which were based on now-outdated research—can obtain the information they need to help themselves to stop the use of the drug.

Time does not permit proper attention to the educational problem. In Canada, reference is frequently made to the failure of all past antidrug educational methods based on recent reports by some American drug education authorities, and their call for a moratorium on all drug education until better methods are devised.

Such a delay in getting this new, clearcut knowledge about cannabis into the hands of teachers, parents, youth, TV, the press and the public could only serve to continue the current escalation in the use of this drug. The benign image af cannabis must quickly be replaced by the image of a drug with potential for serious personal and social harm. A massive educational job is needed immediately.

While touring Capitol Hill last Friday, a group of the doctors who had been testifying here were approached by a boy of about 10 years of age who asked if they were Senators. On being informed that these men were world experts on marihuana, he simply asked "Will it hurt you?" He really wanted to know. So, I believe, do the vast bulk of Canadian and American youth.

That is the end of my statement, sir; I will be glad to answer any questions.

Mr. Martin. Thank you very much for a very illuminating presentation. I must say that you have more or less answered all the questions I was thinking of asking. Because of this, and because of the lateness of the hour, therefore I believe we can safely let the record stand as is.

On the order of the Chairman, the hearing is adjourned.

[Whereupon, at 4:45 p.m., the hearing was adjourned subject to the call of the Chair.]

MARIHUANA-HASHISH EPIDEMIC AND ITS IMPACT ON UNITED STATES SECURITY

TUESDAY, MAY 21, 1974

U.S. SENATE,
SUBCOMMITTEE TO INVESTIGATE THE
ADMINISTRATION OF THE INTERNAL SECURITY ACT
AND OTHER INTERNAL SECURITY LAWS
OF THE COMMITTEE ON THE JUDICIARY,
Washington, D.C.

The subcommittee met, pursuant to notice, at 10:45 a.m., in room 2300, Dirksen Senate Office Building, Senator Strom Thurmond, presiding.

Also present: David Martin, senior analyst, and A. L. Tarabochia, chief investigator.

Senator THURMOND. The subcommittee will come to order. Since this hearing today is a continuation of the one yesterday, it will be unnecessary to swear the same witnesses.

Professor Jones, you were sworn yesterday?

Professor JONES. Yes, I was.

Senator THURMOND. And you will just continue with your testimony today. Now since this portion of your testimony will deal with security in the armed services, we have decided to take this part of your testimony in an executive session.

Mr. Martin, you may proceed now with your questions.

Mr. MARTIN. Thank you, Mr. Chairman.

Professor Jones, in yesterday's testimony you gave evidence of a general nature about the scale of the current marihuana-hashish epidemic in the United States. Is there anything further you would like to say for the purpose perhaps of affirming your estimate of just how big this thing has become?

Professor JONES. In every locality of young people on the college campus, the university campus, or in the high schools that I am able to reach—and I have pretty well been into a sampling across the whole United States—the involvement is of the order of 50 percent of our young people. This means, of course, that we have tens of millions of young people using marihuana, and some of them, of course, use more dangerous drugs.

Probably at least 1 million people are dangerously involved at the present time with use of cannabis and another 5 to 10 million of them will progress to this level over the next few years unless somthing is done to reverse the trend.

So the problem of marihuana probably is a good deal more serious than that of heroin, although the heroin problem is also great. I

think that the heroin problem has been held in check more these last 2 years than I would have thought, considering its runaway nature 6 years ago.

Mr. MARTIN. Primarily this was due to——

Professor JONES. The law enforcement action in choosing the suppression of heroin—the current lack of use of heroin is only because it is not available, in my opinion.

Mr. MARTIN. May I get your reaction to an assumption that I have been considering for the past few weeks. In the case of heroin, we had the law enforcement agencies working against the epidemic in a very concentrated way, throwing in larger numbers of men and operating with larger funds and improved technologies. We also had the entire school system basically on our side. No one thought that heroin was good and no one defended the right to use it.

We also had the entire press on our side, so that you had a united front between Government law enforcement, the academic community, and the press. And this is why—the existence of the united front is why we have had so much success in reversing the trend in heroin use. Would you say that is a reasonable assumption?

Professor JONES. Without contradicting myself, I can modify my statement in that direction. What I meant to imply was that the average marihuana user is relatively unrestrained about the drug use, and if he is in a community of individuals who have heroin available, he is likely to use it.

Now, I do think that the educational program against heroin has brought about an attitude even in the drug movement sector in society in which they are less likely to use heroin than in the past. And, as a matter of fact, I think I have found in my own sampling of students on the University of California campus this year, that the marihuana users are somewhat less inclined to use heroin than the last 2 years.

But you see, last year and the year before that, 40 percent of those who were using marihuana more than three times a week had been experienced users of heroin.

Mr. MARTIN. When you say experienced, you don't mean that they were addicts?

Professor JONES. I don't mean that they were addicts, but they were using heroin every now and then, whenever it was available. And that number now has dropped to a little less than 30 percent; and it is the drop in the numbers of people that I have, that makes it a significant reduction statistically.

Mr. MARTIN. Are these percentages that you give us based on your personal experiences with the 1,600 marihuana users that you have interviewed?

Professor JONES. Yes, but the sample is larger because in my classes I give out questionnaires in which I coach the students as to what kind of information I am trying to get from them and why. And I believe that my questionnaires are fairly reliably answered, and I have a sampling that runs around 500 questionnaires filled out per year, and have kept such records over the last 5 years. So you see, that is 2,500 cases by itself. This does not represent those that I have

interviewed, so putting them all together, I have records of a sort that would amount to a sampling of at least 4,000 individuals.

Mr. MARTIN. I would like to pursue the question that I asked previously, Professor Jones, in the case of the heroin epidemic. It now appears to be accepted by most people who have knowledge of the situation that we have succeeded over the past few years in reducing the problem significantly?

Professor JONES. We must have reduced the problem significantly, because otherwise we would have been in a disaster right now with regard to heroin, because heroin use from 1966 until at least 1972 was doubling every 9 months—an exponential rate of increase. And I had calculated and wrote one significant letter to the President—I don't write to the President of the United States very often—but I wrote a letter that was well conceived, and I believe accurate, pointing out that as of that time there probably were about 1 million heroin users in the United States; most of whom should have been at a level involving dependency on the drug.

Now I don't think we have increased very much since that time. I think the reason for it has been that the supplies of heroin simply have not been enough to keep up with the demand. The demand is not urgent; the demand is just this foolish demand on the part of cannabis users to take any kind of drug that is available.

Mr. MARTIN. I want to come back again to the question I tried to make. In your opinion, is the fact that we succeeded in controlling, or perhaps even pushing back, the level of heroin used in this country due to the fact that we had not only the forces of the law——

Professor JONES. Always in successfully dealing with the drug use problems you have to use the coercive aspect of the law, the seizure of contraband, and the educative force of every agency in society to try and persuade people not to do these foolish things.

Mr. MARTIN. Including primarily the academic community and the media?

Professor JONES. Yes. And everyone has been in concurrence with regard to the foolishness of using heroin.

Mr. MARTIN. Heroin—but when it comes to the question of marihuana we don't have this united front on the part of Government and the media and the academic community? From your testimony yesterday, it appears—and correct me if this is not an accurate reading—that the academic community and the media by and large have been pushing in the opposite direction?

Professor JONES. The academic community is the main source of the problem with regard to propaganda to the use of marihuana; propaganda unfounded in scientific evidence. Nontheless, almost every campus has it——

Mr. MARTIN. You also have some critical words to say about the tolerant attitude of the media in your testimony?

Professor JONES. Yes. They have done their bit because of the sensational aspect of the news in the academic world that the academic world recommends cannabis; or that is to say, marihuana and hashish. The media has been anxious to pick this up because it is sensational.

Mr. MARTIN. And where the forces of education in the academic community and the media are operating, in effect, against the forces

of law enforcement, it becomes very difficult for the law enforcement forces to do their job properly?

Professor JONES. It certainly does. And on top of that, you have a significant segment of the social institutions of this country and their related components in the educational system urging the acceptance of a libertarian view to let everyone do what they want with regard to any life choice, including the use of drugs. And these individuals go well beyond even the libertarian point of view because they also, among their ranks, have those who positively extoll the pleasures and the desirable consequences of drug experimentation.

Mr. MARTIN. Let's come back to the actual scale of the current marihuana-hashish epidemic.

Professor JONES. Yes.

Mr. MARTIN. You were presented yesterday with certain figures compiled by the Drug Enforcement Administration at the request of the Senate Subcommittee on Internal Security, showing the upward trend in marihuana and hashish seizures by Federal agents over the past 5 years. The question was posed in yesterday's hearing: Do you feel that this has serious statistical significance in attempting to assess the scale of the current epidemic? I was wondering whether you had an opportunity to consider this matter further, and whether you might perhaps have used your statistical experience to make some computations that would throw some light on the matter?

Professor JONES. I have taken the raw information that was available in the report and plotted it off on graph paper that I have already submitted for the record. But that is good enough to say that the points show a smooth orderly progression from year to year from 1969 through 1973.

There is no doubt that the rate is increasing, and also there is no doubt that one can say flatly, that the rate of increase for the last 2 years is surely exponential with an increase rate per year in the rate of seizure of 33 percent. This is not a steady state; it is an exponentially increasing rate, and one that will approximately double every 3 years in the level of marihuana and hashish consumed.

It is also interesting that marihuana and hashish turn out to be increasing both at about the same rate, and the present number also indicate that the THC load, which is the active ingredient in both marihuana and hashish, turns out to be about equal for marihuana and hashish for the country at large.

Mr. MARTIN. This is for the last year, 1973?

Professor JONES. For the whole period—well, for the last 2 years, let's say. For the last 2 years, about the same.

Mr. MARTIN. When you say it is moving upward at an exponential rate, what you mean is that on your graph paper it is not moving up in a straight line, it is moving in an upward sweeping curve?

Professor JONES. In an upward sweeping curve. The curve is more parabolic shaped. It is precisely exponential.

Mr. MARTIN. Would this rate of increase be more or less uniform for all segments of the population, or would it vary significantly from one section of the population to the other?

Professor Jones. It varies significantly from one segment of the population to another, but we can also say with regard to each subsection of the population, for the fraction of that subpopulation that is very susceptible to the use of drugs, that the rate of increase in use of marihuana and hashish and other drugs is the same.

In certain groups in the country, though, the young people are fairly resistant to drugs, whereas in other segments the individuals are quite susceptible.

Mr. Martin. Which segments of the population, in your opinion, are the most susceptible? Which segments are most resistant?

Professor Jones. In the many hundreds of drug users I have interviewed I always get an idea about their origins, their family background. The drug users run a little bit more than 2 to 1 from broken homes and from backgrounds in which the home environment is not particularly stable. If the home is not broken, you also have to take into account that either the mother or the father or both are alcoholics. That is a pattern that is very much involved with whether the youngster is going to be susceptible to drugs.

I don't think there is a genetic factor, it is a part of the home environment.

Mr. Martin. You find higher incidence among the lower economic strata?

Professor Jones. Yes, the lower economic strata of the types of individuals that would be involved in what would be called the ghetto structures. It is not a question of the blacks, because whites live in ghettos too. The Puerto Ricans, the whites at low economic levels, and the blacks have undoubtedly the worst drug abuse problem in any segment of the United States, being at least three times as bad as the middle-class population at large.

Mr. Tarabochia. May I ask a question along those lines? The fact that the Army, since it has eliminated the draft system, is forced to recruit personnel from the lower social strata—do you think that this would account for a higher incidence of drug abuse in the Armed Forces, and especially the Army, which may have lower standards than the Air Force or the Navy?

Professor Jones. I think that this is exactly what one would have predicted on a theoretical basis since the habits that individuals have would follow from civilian life to the Army. Whether they use alcohol or tobacco or marihuana, or whatever, they would keep those habits in going into the Army. The Volunteer Army, whose main attraction is that individuals could be higher paid than anything else they could do at home; this works on a straight economic basis—that there would be more individuals going into the Army from the lower socioeconomic groups which are already contaminated by drug use, at least a factor of two and perhaps a factor of three more than the population at large. Then you will get new soldiers who start out at a level of drug use that is markedly above what has been the Army experience in the immediate past.

Furthermore, you have to allow for the fact that drug use has been going up throughout the entire population. So these two combined means that the military experience, for the moment at least, form

the seeds of individuals who can become very heavily involved with drugs. And the problem has worsened steeply over the last 5 years.

Mr. TARABOCHIA. So that you have two elements that contrive to make the problem more accute: the lower strata of the population which is inured to drug abuse, plus the intellectuals who are propagandizing the use of drugs for reasons of their own?

Professor JONES. Yes. The military was fortunate during the Vietnam war in that they had few individuals of the college class who were heavily involved with drugs.

But it is perfectly clear from the statistical records that I personally gathered while I was in Vietnam that the soldiers who were using drugs and got into trouble with heroin and heroin addiction were very much more likely to be the ones who were using marihuana at home before they went into the Army. And the fraction of soldiers using drugs at the time they arrived in Southeast Asia matched the use of drugs in the population of the same age for that calendar year that we knew in the home population.

Mr. MARTIN. I want to backtrack just a little bit to make sure that the record is clear. Now you say that the rate of use in the lower socioeconomic strata is greater than the average for the general population by a factor of two or three?

Professor JONES. Yes.

Mr. MARTIN. Do you have a rough idea of what percentage of the present volunteer Army is recruited from the lower socioeconomic strata?

Professor JONES. No, I don't have that information, but we could get that.

Mr. MARTIN. It would be the bulk of the Army

Professor JONES. It would probably be the bulk of the Army at the moment, since it has gone over to the volunteer basis. But the point I was making was the fact that during this time when the military has had such an obviously difficult time with drug users, which was the war in Southeast Asia, the bulk of the soldiers who were being inducted into the Armed Forces were outside of the college class. If they had had even a third of their soldiers drawn from the college class, they undoubtedly would have picked up more drug users, because at the time it was the college class that was heavily contaminated with drugs.

Now that contamination has spread more uniformly through the population as a whole, but there is still a differential, especially with regard to the level of drug use per person involved in which the lower socioeconomic groups are two to three times more involved with drugs than the middle class American.

Mr. MARTIN. So, as a rough estimate, do you think that there may be twice as much drug use per capita in the Armed Forces?

Professor JONES. The potential for having difficulties of the types seen in Germany and Southeast Asia during the last 5 years has gone up, probably at least a factor of two with regard to the military because they are now taking in soldiers who are much more contaminated to begin with in terms of habits to use drugs and marihuana and beyond from the very beginning.

Mr. MARTIN. Could you tell us something about your specific findings in the course of your investigations for the Department of Defense in Vietnam and in Thailand and in Germany and in the United States?

Professor JONES. I made two trips. First of all, the one was I believe in 1970 and the other in 1972, to Vietnam, arriving in Saigon and going through a selection of bases by helicopter in South Vietnam for the purpose of looking at the cause of heroin use and demonstrating to the Army what could be done about rehabilitation of heroin users.

In my first visit, I interviewed approximately 28 heroin users in a 2-week period. I spent a lot of time in the interviews, so that represents quite a bit of work. I was able to show, and I knew before I went, that heroin users are sexually incapacitated. And we were able to use this information of a very significant type in drug prevention education.

We worked out the usefulness of the system, and also it's a major factor of persuasion in getting the heroin addict to want to be rehabilitated; to remind him of the fact that the sexual functions can come back.

Mr. MARTIN. During this trip you also made some observations relating to the use of Vietnamese marihuana which was very widespread among our Armed Forces?

Professor JONES. Yes, I looked into the matter of cannabis intensively. I did much more than just interview heroin addicts. I was interviewing and talking to every soldier and officer I came in contact with with regard to a large number of questions that I had in mind about the drug problem in the Armed Forces.

Mr. MARTIN. These interviews were over and above the interviews with the 28 heroin addicts?

Professor JONES. Yes, indeed. Altogether I would say in the three trips to Southeast Asia that I interviewed 88 heroin addicts, but I probably interviewed on the order of 300 individuals who were not involved with the use of drugs, because I considered every person that I would talk to, that I could get a chance to ask some questions, a source of such information.

Mr. MARTIN. We are interested in the information you gathered specifically with relation to cannabis rather than heroin, because we are not concerned with heroin as such in these hearings.

Professor JONES. The primary problem in Southeast Asia was cannabis. Heroin was a problem too, but the cannabis was also a very grave problem.

Mr. MARTIN. How did it affect the security of our Armed Forces, or are you in a position to offer any enlightenment on that?

Professor JONES. Well, the use of cannabis was a good deal more prevalent than the use of heroin. And also, it has such a persistent effect in making soldiers sloppy in their thinking, susceptible to all sorts of suggestions of an absurd nature, and careless in all matters.

Mr. MARTIN. Is this based on your personal observations or is this based on conversations with the commanding officers?

Professor JONES. I did not find a commanding officer who knew

that much about the cannabis problem, but they were worried about the use of cannabis. This was my own information, largely based on the total interviews that I have made of cannabis users. They are all persistently affected in a number of separate ways that can be documented, in mental functions, all in the direction of being less acute in their thinking, less organized in their thinking, less memory, and able to take less responsibility.

Mr. MARTIN. Did any of the officers you spoke to express concern that the breakdown of discipline or the weakening of discipline in the American Armed Forces in Vietnam might somehow be related to the widespread use of cannabis?

Professor JONES. The officers I talked to in Vietnam were worried about cannabis because they suspected that this may have been a part of some of the terrible events such as the murdering of officers.

Mr. MARTIN. The so-called fragging?

Professor JONES. The fragging of officers, yes. And believe me, all of the officers were uptight about this situation because they didn't know when it might be their turn. The incidence wasn't so great that it would be likely to induce a neurosis in the officers, but it was great enough to worry about, and they knew that this kind of event was not associated with the heroin user, but rather with the cannabis user, and also the amphetamine user. But the amphetamine user also had to be a cannabis user, and the tie between these two is very, very great.

Mr. MARTIN. There were a number of officers who expressed concern to you that the incidence of fragging, which reportedly was very high, might be directly related to the widespread use of cannabis?

Professor JONES. Yes. They also believe that it might be due to the amphetamines that were used there. I am not able to tell you at this time, I will have to go back to my notes, what the amphetamine was that was being used, but it was an amphetamine that produced a psychotic state. It is not available in the United States.

Mr. TARABOCHIA. Was it speed?

Professor JONES. No. Speed is methedrine, and this was a German-made amphetamine which has not been available in the United States.

Mr. TARABOCHIA. This was available in Vietnam?

Professor JONES. Yes, it was available in Vietnam. The one thing that was fortunate in Vietnam was that they did not, during the years of the war at least, up to 1973, have to face the special problems of cocaine users. But the Armed Forces were rightfully worried that at some point in time cocaine might be introduced. The drug that was mostly available in Vietnam, or the two drugs, were the home grown varieties of hemp, the cannabis drug, and also the pure heroin which was available in large quantities below the world market price.

Mr. TARABOCHIA. Am I correct in assuming that the potency of native cannabis in Vietnam is higher than the ones found here, Mexico, and Jamaica?

Professor JONES. Practically all of the users that I interviewed were convinced it was 10 times higher than at home. I think the fact

is that it would probably be about five times higher now, because the quality of marihuana at home has gone up recently quite significantly. But in the period of 1971 to 1973 when I was getting this data in Southeast Asia, those who were using marihuana freely said that it was 10 times more potent than at home. It would certainly be 10 times more potent than, say, varieties grown in California, and maybe 50 times more potent than the weak little marihuana grown in flowerpots on window sills.

Mr. TARABOCHIA. And I presume that because of the fact that it was locally grown and easily available it was even more pure than the type of marihuana that can be found in the local market?

Professor JONES. It was just stronger. Southeast Asia is a tropical zone. It has good soil. And the marihuana plants grow high with rank foliage, and the foliage is glistening with the resin that is the active ingredient in marihuana.

Mr. MARTIN. To come back to the question of the problem of security and the use of cannabis. Apart from the fact that many officers expressed concern to you that there might be a connection between fragging and the widespread use of cannabis, do you have personal knowledge of any specific instances where there were violations of security or breakdowns in performance—in combat performance—or in the use of vehicles or aircraft, as a result of the use of cannabis?

Professor JONES. No, I was not in a position to get that kind of information. The only infraction of military rules that I actually saw while I was there was that a sergeant and an enlisted man were driving into a camp enclosure in a military truck, and a sentry searched the truck and found prostitutes in it. But that was the only thing. And then, of course, the women were shooed out.

Mr. MARTIN. But you have no information that this was specifically related to the use of marihuana?

Professor JONES. No, it was not related to the use of marihuana. But it is interesting that the segment of the soldiers who were very much interested in prostitutes is very likely to be the segment of soldiers that are interested in the use of the drugs, especially marihuana. And I never saw a heroin user in the army who had not been active in the use of prostitutes, whereas in soldiers in general I doubt if the use of prostitutes is as high as 50 percent, because the more restrained individual is not so crude in his behavior.

Mr. MARTIN. But were you not saying a while ago, Professor Jones, that heroin inevitably results in a loss of sexual potency?

Professor JONES. Yes. But these were the individuals earlier in the stage of their career as soldiers who had not yet taken heroin, who then became heroin addicts. In the beginning they were using marihuana and using prostitutes, too.

Mr. TARABOCHIA. Also, the use of prostitutes as a means to obtain the money to pursue the habit of drugs. You have females who prostitute themselves.

Professor JONES. Well, it was different in Southeast Asia. The prostitutes there were not interested in getting money for drugs, whereas in New York City, where I have interviewed prostitutes,

they turn out to run very heavily into heroin addiction. And it works out in two ways; one, they have essentially sexual impotence as far as the emotional side of sex is concerned, so it makes their business just a mechanical one; and they are also interested in being prostitites because they can get enough money to buy the drugs that they need. So it is a feedback circle.

In Southeast Asia the prostitutes are not drug addicts, and the only source of effective education is that the prostitutes knew that those who were using heroin would not function sexually. So they were spreading the word and were the only source of precautionary information that I encountered.

Mr. MARTIN. I want to come back to the question again of the general impact on our Armed Forces and how, specifically, the use of cannabis on an epidemic scale may relate to the question of security in the Armed Forces. It has been testified at the hearings held over the past several days by a number of psychiatrists that people under the influence of cannabis tend to be suggestible; they can be more easily manipulated by agitators.

Professor JONES. Yes.

Mr. MARTIN. Would that jibe with your own experience with cannabis users?

Professor JONES. Yes. I have been pulling my notes together along this line. But there is no doubt that the marihuana user is more susceptible. We classify marihuana as a hypnotic drug. I think it is fair to say that one of the persistent effects of marihuana is this hypnotizing depression of the will and the ability to use reason in a precautionary fashion. They are very much more likely than anyone else to be drawn into impetuous and foolish activities. And I have two examples that I think are quite secure in the support of this statement.

Many of the young men that I have interviewed on the college campus who are marihuana users have been induced into homosexual activities. But if they confide this to me, it is usually on a basis that they have been very worried about it and they have been anxious to talk to someone who is professionally qualified along these lines, because they felt that these experiences had been very hurtful to them.

I have also had three in this category who have sobered up by going off of the use of marihuana and hashish totally for a period of several months, and these three have said without any doubt on a reinterviewing that their foolishness in taking on a homosexual experience was due to the fact that their will was so depressed that they just were not able to say no.

Mr. MARTIN. Let me come back to the question of manipulation by agitators.

Professor JONES. I did not finish my examples, though.

Mr. MARTIN. Go ahead.

Professor JONES. The other big evidence for this is the relationship between marihuana and heroin. If a marihuana user has not yet used heroin, he will be vociferous in saying, "I would certainly not use heroin under any circumstance. People could stand there and even offer me money to use it and I would not use it because I would

only use marihuana." Yet, I never saw in my own interviews of heroin users, which is now up about 600 individuals, I never saw a one that did not use marihuana to begin with.

Mr. MARTIN. You did not see a one in all 600 interviews?

Professor JONES. All 600 interviewed were marihuana or hashish users before they became heroin addicts.

In Southeast Asia I interviewed a number of individuals who were obvious smokers, so I asked every smoker, "Have you ever been offered a skag cigarette?" And they would say, "Sure, it would be impossible not to be in Southeast Asia as a smoker and not have someone offer you within a year's time or so a skag cigarette." But the smokers would not accept a skag cigarette. But if this person were a marihuana user, surely the chance must be high that he would accept the skag cigarette, because this is where the heroin users came from.

I never saw a heroin user in Southeast Asia who had not been a marihuana user. Now, the only difference between my records in this regard and the Army questionnaires that have been filled out—the Army kept track—Well, I saw a tabulation of 2,500 heroin users in Vietnam, and I am sure the Army record by this time has gotten into much higher numbers. But 2,500 is a lot.

The Army showed that approximately 10 percent of the questionnaires filled out by the heroin users indicated they had never used marihuana. But I think that is because, if you just hand a person a sheet and do not explain enough, you may get a little bit of misinformation.

Two of the individuals out of 88 that used heroin that I interviewed put down or tried to tell me at the beginning of the interview that they had never used marihuana before they used heroin. And in the course of the interview I found out that they had used marihuana before they had used heroin. I said, "Well, why did you lie to me?" And they said, "We did not lie. We were not addicted to marihuana, and therefore it did not count." And this is the reason why the Army, with regard to questionnaires, finds that only 90 percent of heroin users have used marihuana before when the real thing is close to 100 percent.

Mr. MARTIN. You think the questionnaire method, then, is defective in trying to elicit a clear picture of the drug situation?

Professor JONES. The Army has not done this intentionally, of course. It is just the nature of questionnaires. You never get quite as accurate information from questionnaires because the questions are not asked free of some of the ambiguities that people can read into the question. And these two individuals were probably correct in their own mind in saying, "Well, they were looking for addictive drugs and I was not addicted to marijuana. I just used it occasionally. It did not count."

Mr. MARTIN. This points to another question dealing with our general situation in the country. Most of the information we have about the prevalence of cannabis use is based on questionnaires?

Professor JONES. Yes, it is.

Mr. MARTIN. Obviously, they do not go in for personal interviewing on a large scale?

Could this be part of the explanation for the great discrepancy between official estimates of the extent of cannabis use and the calculations you have made, based on the amount we know was seized or intercepted by Federal agents over the past 5 years?

Professor JONES. I think it explains the secondary discrepancies in information and explanation. I do not think there are any major discrepancies in information, because everyone has agreed that we have a problem, not only with cannabis, but with LSD and amphetamines and heroin. The question is trying to decide precisely what fraction of each subsector of the population is involved, and that is why I say it is a secondary variation. But I do believe that you get more accurate information from a one-to-one interview, especially when the person is experienced in conducting the interview.

Mr. MARTIN. Coming back to the question again of manipulation, there is one specific aspect of this that the subcommittee would be particularly interested in. It is common knowledge by this time that there are organized subversive groups within the Armed Forces. There has been a good deal of organized agitation and the distribution of literature and the formation of underground groups within the Armed Forces, and so on.

Have you heard about this phenomenon in the course of your travels around Asia and Germany?

Professor JONES. Well, I certainly am fairly sophisticated with regard to the existence of revolutionary groups and the mischief that they do, and I did pick up in my studies for the Army individuals that must have been affected by this. This was not in Southeast Asia.

I think in Southeast Asia, under the conditions of actual warfare, that there would have been likely less of this. But in Germany, where the troops were idle and the commanding officers perhaps not so pressed to take care of this, it would be more likely. At least in Germany I encountered two individuals that I would say were extremely alienated from our society and considered themselves revolutionaries. And they both said, as a measure of their alienation, that as soon as they came back home they were going to get guns and start killing whites at random.

One of these happened in the presence of an Army captain, who was a trained psychologist, and afterwards I said to him, "Are you not going to report this? Here is this man who is obviously so agitated that you can consider him beyond the range of just an ordinary person with a behavioral disturbance. He is a dangerous individual."

And he sort of shrugged his shoulders about it. But the fact is that I take this man very seriously. I think that he and the other one who was saying the same thing——

Mr. MARTIN. Both of these men were on cannabis?

Professor JONES. Both of these men were cannabis users. I think they were suffering from cannabis toxicity, and I think they were also suffering from being worked on by revolutionaries in the Armed Forces.

Mr. MARTIN. Is this an assumption on your part?

Professor JONES. It has to be an assumption because I do not know more than that. I would have liked to have explored this in more

detailed conversations with the man, but it is—this kind of sophisticated emotional planning to go home and start shooting people is not likely to occur just spontaneously with hashish use or marihuana use. You have to have someone to put the bee in the bonnet, so to speak. The propagandists must have been working on these individuals.

Mr. TARABOCHIA. Professor Jones, with regard to your statement, were you aware of the presence of civilian legal counsel whose purpose was to assist military personnel under court-martial proceedings for violations of drug abuse, who were also members of radical leftist organizations such as the National Lawyers Guild or other related organizations?

Professor JONES. No, that did not come up during my visit. But I was not involved in any of the court-martial proceedings or any of the legal proceedings against these drug addicts. I was at the drug treatment centers, and the climate there would be to soft-pedal any information of this sort, because my attitude and the attitude of the medical personnel would be to get as much cooperation from these men as possible.

I do not remember any discussion of possible court-martial proceedings.

Mr. TARABOCHIA. Are you aware that a group of these organizations has brought suit against General Davidson because of the alleged harassment of the soldiers who are suspected drug users?

In other words, removing the doors from the rooms of known drug abusers?

Professor JONES. I did hear this or read it. I think I read it in the newspapers. But I do not know any more about it than that.

Mr. TARABOCHIA. How would you construe such an action, in view of—in the light of your past experience and studies?

Do you think that this is an attempt to camouflage the drug abuse epidemic, under constitutional rights of a soldier?

Professor JONES. Well, I do not know, of course. But I would guess that that would be a part of the motivations of these individuals. The antiwar groups and the legalization-of-drug groups are overlapping movements, and have some of the same people involved. Almost all of the individuals in these present movements are highly alienated from society. You find all sorts of weird notions characterizing them. It would be very easy if someone wanted to measure the degree of alienation, to construct a questionnaire or a word choice or something of this sort and get a profile on such persons. But I have not done that.

Mr. MARTIN. A few more questions by way of clarifying some of our discussion. In speaking about the increase in the drug epidemic, you make the point that not merely are there more people involved in many strata of society, but that there has been a rate of progression in the use of marihuana and hashish affecting every individual user. That is, if they started a year or two ago, they are probably using substantially more today.

Professor JONES. Every marihuana user tends to progress in use, not only in frequency of use but in dose. And the more that they do progress, the more exhilarating it becomes. We find this in all sorts of users.

In tobacco users, a cigarette smoker may start and smoke maybe one cigarete a day. But the average person quickly gets up to a pack a day and would go beyond that except the cigarette smoker has too much time wasted if they smoke more than a pack a day. It becomes mechanically difficult.

Mr. MARTIN. This progression in the amount used by the average user—would not that, perhaps, be reflected in the answers they get to questionnaires?

Professor JONES. Yes, it would be reflected.

Mr. MARTIN. It would be reflected?

Professor JONES. Yes. Well, I have no difficulty in my questionnaires of getting information about rate of drug use and showing in my records of several thousand cases that the average amount of drug use, such as cannabis, progresses with duration of time of use of cannabis. The person who is using cannabis daily, for example, takes about 3½ years to get to that point from beginning, say, in occasional use. The alcoholic who is using alcohol to the same equivalent status in terms of intoxicating effect has taken 20 to 25 years to come to this point from the beginning, in which he was using alcohol occasionally.

Mr. MARTIN. So if a beginning cannabis user comes into the Armed Forces and nothing is done in the form of education to discourage the habit, the chances are that he will continue to use more and more and more while serving in the Armed Forces?

Professor JONES. He will accelerate more rapidly than at home, because he has more time on his hands. He tends to be bored, and also, the drug is more readily available and the climate in both Germany and Southeast Asia for the social life of the soldiers has been one of peer reinforcement of the drug use. So that all three of these combine to make the progression into drug use much more rapid than at home.

Mr. MARTIN. What do you think could be done by the Armed Forces to cope with this problem? What prophylactic measures could they take?

Professor JONES. Here I would like to talk about an hour.

Mr. MARTIN. We will not be able to give you quite an hour. But suppose you do your best in 20 minutes or half an hour.

Professor JONES. Well, I think this is the No. 1 problem, what can the military do. At the present time the drug preventive education in the military services is about the same as it is in the college campuses—essentially nil. It would be possible to turn this around.

Mr. MARTIN. Is it nil on the question of heroin?

Professor JONES. Not now. During the time when the heroin problem was not recognized, there was no campaign against it.

Mr. MARTIN. But today there is an effective antiheroin educational campaign?

Professor JONES. There is an effective antiheroin campaign in the military.

Mr. MARTIN. Is there an effective—at least effective in some degree—anti-cannabis education program?

Professor JONES. No, there is not. Fourteen months ago in my last visit to Southeast Asia, part of the arrangements for my trip through the Department of Defense was that I would be one of the speakers in an all-military conference on drug abuse being held in Bangkok, and

when I arrived the commanding officer was really in quite a state, because the conference had been taken over by some of the psychiatrists and physicians who were recommending the legalization of cannabis and they were holding that cannabis is okay.

Well, they had had a day of this, and I was the lead speaker in the morning, and in the middle of my talk several of these people began to challenge me. And of course, I just backed them right into a corner, and each time I would show the foolishness of their statements I would get loud cheers from the people present. In other words, the majority of the professionals in the Army who were part of this conference agreed with me, but they did not know how to formulate the answers to these promarihuana people.

Well, that conference then did not get beyond this point, because they kept me on the platform for the rest of the day and into the night. We just were discussing this problem. But I can tell you that the same situation also exists in Germany, but I did not get tested in the same way. But I certainly ran into many individuals in the Army in Germany who believed that cannabis is okay.

The majority of Army professionals did not feel that way.

Mr. MARTIN. Who were the individuals—soldiers, officers?

Professor JONES. It was likely to be individuals entrusted with the drug abuse problem. They would say, in effect, cocaine is bad and heroin is bad, but marihuana is okay.

Mr. MARTIN. These were individuals that were entrusted with the drug education program or the drug rehabilitation program or other aspects of the drug problem?

Professor JONES. They tend to be the same. The drug rehabilitation program tends to be coextensive with the drug education program. So this kind of confusion which comes from the effort to legalize marihuana at home that has spilled over into the Armed Forces, and it makes it very difficult to come to grips with the central problem in drug abuse in the military, which is cannabis, because it is from cannabis that drug abuse of all other kinds stems. And also, cannabis by itself is perhaps more of a threat to members of the Armed Forces than the other drugs.

Heroin users, at least as long as they are supplied with heroin, might be able to do their job in the military and not make quite such blunders as the cannabis users. The cannabis users are never sober and never out of the umbrella of the hypnotic effects of the stuff. They are just patsies to make foolish, impetuous decisions.

Mr. MARTIN. When you say they are never sober, does this also apply to the occasional cannabis user who smokes a cigarette or two a week?

Professor JONES. Yes.

Mr. MARTIN. They are never completely sober?

Professor JONES. They are never sober.

Mr. MARTIN. Why is that?

Professor JONES. Because there is a residual effect on the brain that can be tested for, with regard to clinical approaches to the problem or clinical approaches to assessing that effect. And also, everything we know about cannabis in terms of the measurement of how much goes

into the body and into the brain and stays there, a part of the burden is still there days, weeks, months later.

Mr. MARTIN. This bears on the testimony given by Dr. Axelrod at yesterday's hearing?

Professor JONES. Yes, it does, and the subsequent discussion we had between him and me.

Mr. MARTIN. Would you continue?

Professor JONES. Yes.

Now, I think the drug preventive education in the military could be made just as effective as I have been able to demonstrate on the college campus. As I have mentioned before at these hearings, I have given a course for 5 years. Every 6 months I give a course lasting 3 months, offered to anyone who wishes to attend. It started with approximately 130 students taking it for credit. At present I have 390 taking it for credit. There has been a steady increase in enrollment.

Most of the students who come into the course are drug users, at least measured by the fact that they use cannabis on some kind of a recurrent basis. There is also no doubt but what the students in a relatively short period of time will change their attitude about cannabis and stop use of cannabis. I do not get everyone in the class off cannabis and other drugs, but the majority of the class will be off drugs, usually in about 2 months of the course. Some individuals that have been holdouts may not get off of cannabis for another month or two beyond the course. But I do have information that they get off.

Interestingly, in each class there has always been the person that defends cannabis, the student who is very bright and also aggressive enough so that he can stand up in class and argue with me. In each class, that is always the person that I can count on for sure coming over to our side and quitting cannabis use.

Mr. MARTIN. Because he is bright?

Professor JONES. Because he is bright, and because he has put out the arguments that have to be put out from his standpoint, and they have been answered. All of the arguments about the safety of cannabis or the desirability of using it as a worthwhile experience can be completely put to rest as far as the young people are concerned, and also today the hazards that they face such as to the possible damage to their offspring, the fact that they may not progress in the development of minds and bodies such as they hope to have—these are enough to deter them. And finally, if individuals are not able to see the advantages of keeping their minds going, there is the fact that every person I have ever talked to about drugs can visualize what is happening to the lungs. The problem in the lungs from cannabis use is of itself enough to deter cannabis use.

And then there is the matter at the end about sexuality. Sexuality simply goes with cannabis use, as with heroin, except it fades more slowly than with heroin, but just as surely. And as you know now, there is not only the evidence of impotency and lack of sexual vigor in all forms, but there is the direct measurements as presented here by Dr. Kolodny and coming from the Masters group, which is the

most eminent group in the sexual sciences, showing the depression of male sex hormones to an alarming degree.

These things are all one needs in fully effective drug prevention education.

Mr. MARTIN. And you feel the things you have mentioned as ingredients of an effective drug education program go over just as well with GI's as they would with college students?

Professor JONES. Yes, I do. And I can say this not idly, but when I was in Germany I talked to soldiers brought together for this purpose, and in each of my visits in Southeast Asia I did the same thing. There is no doubt that I am just as effective with soldiers as I am in the classroom.

What I have been urging the military to do for at least 2 years is to set up drug educative programs in which I can have a major input, because I know how to do this. And I can train people so they can be almost as effective as I can be with regard to handling of this information.

I have also offered to make for the military—and this is currently being arranged, but we have not made them yet—a series of video tapings of lectures in the style and using examples that I think would be most effective to the military. They have video tape playing machines everywhere that they could use these. Using me canned would be a lot better than letting the average sergeant discuss the problem, or the average captain, who is not informed about what should or could be said. But it does mean that with such information, the average drug prevention officer in the military would be on a very secure basis to follow it up, then, with what he can say to those soldiers that are involved.

Mr. MARTIN. That leads to a rather basic question, Professor Jones. Before you can have the military accept the essential fact that we are confronted with a major cannabis epidemic, and before the military, accepting this fact, can embark on an educational program adequate to cope with the situation, would it not be necessary for the Government of the United States or for those segments of the Government of the United States that are concerned with drug abuse and drug prevention, or drug abuse prevention, to be more correct—would not the Government have to initiate such a crash program of education directed to the people as a whole? I mean, you cannot isolate the military from the Nation as a whole?

Professor JONES. I think you put your finger on the real problem. The military has tried, of course, many times to inhibit drug use. But in the conference that I attended in Southeast Asia, it was an obvious example of how a good intention on the part of the army to get everyone educated and cooperating with regard to a real problem in presenting drug education, that this was being torpedoed by those who felt that marihuana is a tolerable drug. These individuals vociferously attacked anyone present who was against the use of marihuana, largely by calling them a bunch of "juicers," referring to alcohol use, and they were willing to tolerate alcohol but intolerant of cannabis, whereas cannabis users knew that cannabis was less harmful than alcohol, and actually the use of marihuana is a step

ahead. "As long as you have to have one drug or another, you might as well have cannabis." This was the argument.

Mr. MARTIN. Were the people who made these statements actually involved in the Armed Forces drug program?

Professor JONES. These people were involved in the Armed Forces drug conference in Southeast Asia in March of 1973, which I attended.

Mr. MARTIN. Does this not strongly suggest that there is a serious lack of education on the subject of cannabis in the Armed Forces?

Professor JONES. There has been a very serious lack of education on the subject of cannabis in the Armed Forces. And a step of the same sort is the fact that the military has always been undecided as to what it is going to do about the use of alcohol in the military forces. There has never been a clear-cut decision that it either should be tolerated in terms of ad lib use or that anything should be done about it.

I think the same kind of schizophrenic debate with alcohol abuse has been passed over into cannabis because it is so easy to prove, with the information afoot, that cannabis is the same sort of drug.

Mr. MARTIN. The information available?

Professor JONES. The present information that is available to most individuals will lead them to believe that alcohol and cannabis are very similar types of drugs.

Mr. MARTIN. Whereas you testified yesterday that cannabis is a much more dangerous type of drug?

Professor JONES. At least by a factor of 10 and probably 30 or more times more harmful.

Mr. MARTIN. And, as you pointed out before, smoking cannabis two or three times a week is enough to leave a person in a permanent state of intoxication or partial intoxication?

Professor JONES. We never see this in alcohol. A person getting over it, they may have a hangover the next day, but within a week he surely is completely sober, with no detectable traces.

Mr. MARTIN. Within a week?

Professor JONES. Within a week for sure.

Mr. MARTIN. It takes that long to get over alcohol intoxication?

Professor JONES. I dare say from a state of drunkenness, in which case we know that the hangover lasts the next day, that we would be on safe grounds if we said that a week later that that person would have no detectable traces by even the most advanced techniques of measuring mental function. The effects of alcohol wear off within that time—whereas, with marihuana, a person using marihuana heavily would easily have detectable traces of it over a period of perhaps a full week from that single use. And as a chronic user, he may still have accumulated effects from all of the uses that he has had. It is quite different.

Mr. MARTIN. Let me pursue this question. If we are going to have an effective program of education on cannabis in the Armed Forces, this would have to be part of a larger national program of education on cannabis?

Professor JONES. It would be a lot easier for the military to do it as a part of a national program against the use of cannabis.

Mr. MARTIN. Reflecting a commitment by the Government?

Professor JONES. Reflecting a commitment by the Government, so that the military does not have to do it alone, and so that the individuals who are so outspoken and not hesitant at all about attacking individuals—after all, most of the people that were from this country who were witnesses during these hearings testified to the extent of personal attack on them. Surely, I can add to this from my own records as to how many times I have been attacked by those who are either using marihuana or trying to legalize marihuana.

This is an unpleasant thing to have to face by any person. And in the Armed Forces, our generals and lesser commanders are not used to being singled out for this kind of semiprofessional debate in which there is personal vituperation involved, as well as discussion of some of the professional issues. People tend to shy away from this. It becomes a nasty, unpleasant situation.

Mr. MARTIN. Would that not also be true for some of the people in Government?

Professor JONES. Yes, I think so. But then we also have within Government, as we had evidence in the Armed Forces, individuals who feel that marihuana is tolerable, and who, for varying reasons, are on the side of the forces who are trying to legalize drugs at the present time. So the Government does not have a monolith of unity of thought on the subject of marihuana, and there is divisiveness afoot. It is hard to move Government when there is a division, even though the division may involve the minority.

Mr. MARTIN. Is this division reflected in any way in the publications put out by the Government, the various Government drug offices?

Professor JONES. Yes. It is easily seen in the official reports of Government. I think that the individuals who are involved are, perhaps, a real minority, not more than 10 percent of those who are professionally involved. But they are so emotionally bent on doing what they can that they almost ruin the whole report, because they manage to get their influence in in every single channel that they can exercise it. You can see this.

The Shafer Commission report was completely distorted by just a few individuals. I think that the report of the Secretary of Health, Education, and Welfare, the three separate reports, were also distorted for the same reason. The current one, which counts as an enormous improvement over the other two, is still a report that is inadequate scientifically and not at all of the level that one expects.

Mr. MARTIN. When you say it is inadequate scientifically, it does not reflect the new scientific information available? Or what is the nature of this inadequacy?

Professor JONES. When it discusses the new scientific information, it does not manage to focus on the significance of it. For example, in reviewing the work of Soueif in Egypt, they never once mentioned the fact that this is important because it identifies in large-scale observation the persistence of cannabis effects, nor does it even bother to quote the underscored conclusions of Soueif, who was very definite about noting that the effects of cannabis occurred in hashish users in every stratum of society, except the greater the intellectual

achievement of the individuals the more seriously they were affected by hashish.

Furthermore, the report went on to say—that is, the report from Health, Education, and Welfare—they went on to suggest that the information by Soueif might be put aside, since there was not this level of hashish use in the United States, inferring that marihuana is still at a low level of usage and at a low level of strength of preparations used, which we know not to be the case. Especially during the last 2 years, when hashish has come into very common use, approximately half of the marihuana users are getting their cannabis in the form of hashish at the present time.

I know from my interviews of cannabis users that they are using potent varieties of hashish commonly. So we have a situation—we can say confidently that the United States has more hashish users than Egypt.

Now——

Mr. MARTIN. Are you talking about more hashish users in absolute numbers or per capita?

Professor JONES. In absolute numbers, I think we have more hashish users in the United States than Egypt.

Mr. MARTIN. Then not on a per capita basis?

Professor JONES. Perhaps even on a per capita basis. I may be wrong on that. It is an off-the-top-of-my-head comparison, but all the Egyptians that I have known assured me that the vast majority of Egyptians do not use hashish or cannabis, and it is a much smaller population than ours. And we have a much larger fraction of our population, at least for youth, involved in the cannabis drugs. So I think we would come out as having more hashish users in the United States than in Egypt.

Mr. MARTIN. If I may, I would like to try to summarize your recommendations, as I understood them.

You feel that the problem of drug education, especially with reference to cannabis, can only be handled effectively in the Armed Forces if it is a part of a larger national program.

Step number 1 in this program would be a recognition by the Government that we are confronted with a very serious situation.

This would have to be preceded by a recognition and acceptance of the now-massive evidence about the harmful effects of cannabis, a recognition of the fact that there is an epidemic, and an acceptance of the need for a crash program to roll back the epidemic and educate the people and present them with the facts about cannabis. And against that background and within that framework, it would become feasible to conduct an effective program of education specifically tailored for our Armed Forces.

Professor JONES. I believe everything that you have stated. The only thing is that I would hope—and I think it might come about, because the problem is so urgent within the military—that even if the Government as a whole is not willing to take action, that the military will and can go ahead and do it on their own. But it would be ever so much more easily done and more effective if it were a total Government effort.

There is need for a total Government effort because the civilian population really needs the Government's help. And the Armed Forces, in my opinion, are going to have very grave difficulties in maintaining an army that is really reliable and that can function in the face of the possible hazards for drugs that lie ahead unless something is done about it.

Mr. MARTIN. And these hazards will grow as the epidemic continues to spread in the population as a whole?

Professor JONES. Yes. The army will not be able to get any segment of the population inducted into the military force that is free from drugs so they can start with an uncontaminated group. I believe that the army and the other military forces can start with individuals who are contaminated with drug use and recondition them, in terms of their mental attitudes, strengthen their ability to deal with all sorts of problems, which is a matter of education, and rebuild them mentally as well as physically so they can be effective members of the Armed Forces.

These methods are available. It is just a question of trying to organize them and put them into effect.

Mr. MARTIN. There is a question I meant to ask sometime back. Does the rate of cannabis use vary from one armed service to another?

Professor JONES. Yes.

Mr. MARTIN. Or is it pretty well uniform?

Professor JONES. No. The rate of cannabis and other drugs varies from one division of the armed services to another, in the first place. There is also a very great variation depending upon what company one might be in. There were a few companies in Southeast Asia where the whole company was just in hopeless confusion because of heavy drug involvement, with cannabis being the principal one.

I would say that this was where the commanding officer had been particularly lax with regard to taking any precautionary measures. I think that the kind of cavalier attitudes that have prevailed might have been all right under ordinary circumstances, and perhaps the men under ordinary circumstances would have felt that the commander was a whale of a good guy because he gave so much latitude and permission. But in facing the drug epidemic, you had to have a commander that really pulled the reins up tight. And where the reins were pulled up tight, you could see the difference in the drug problem. The army has been able to demonstrate over and over again in Southeast Asia that when they took firm action, the drug abuse went down, just as you can show that in civilian life.

Now, the difference between the Army and the Navy and the Air Force are in that order. The Army has had a greater use of drugs; the Navy, the next greatest level of use; and the Air Force least.

Now, it is not entirely that the Army has had more land-based connections to the supplies of drugs, although this is one of the factors. I think it is sort of the esprit de corps, the training that goes into individuals, the training that makes individuals take more responsibility. This has been necessarily at a higher order for the Navy and at a higher order yet for the Air Force. So it shows it can be done.

And, to some extent, too, they have been more selective with regard to the origins of their personnel. But today you cannot be sure with regard to any segment of society that you have eliminated the possibility of drug use by taking a person of good apparent qualifications, because that person may be contaminated. So the military would be well advised to use corrective methods in preparing, from boot camp, or whatever officers training procedures will be involved, to incorporate within that antidrug abuse education of the most effective sort where it is meaningful and convincing to the persons involved.

Again, it can be done. But you cannot do this with individuals that say marihuana is tolerable.

Senator THURMOND. I want to thank you very much for coming here today and for presenting us with this very important information, Professor Jones.

The hearing is now adjourned, subject to further call of the Chair.

[Whereupon, at 12:20 o'clock p.m., the subcommittee was adjourned subject to the call of the Chair.]

MARIHUANA-HASHISH EPIDEMIC AND ITS IMPACT ON UNITED STATES SECURITY

THURSDAY, JUNE 13, 1974

U.S. SENATE,
SUBCOMMITTEE TO INVESTIGATE THE
ADMINISTRATION OF THE INTERNAL SECURITY ACT
AND OTHER INTERNAL SECURITY LAWS
OF THE COMMITTEE ON THE JUDICIARY,
Washington, D.C.

The subcommittee met, pursuant to notice, at 2:20 p.m., in room 224, Russell Senate Office Building, Senator Strom Thurmond, presiding.

Also present: David Martin, senior analyst; A. L. Tarabochia, chief investigator; and Robert Short, senior investigator.

Senator THURMOND. The subcommittee will come to order.

Over the past month the Senate Subcommittee on Internal Security has held a series of hearings on the marihuana-hashish epidemic and its implications for U.S. security. Todays hearing is part of this series. It will deal specifically with the question of cannabis abuse in the U.S. Armed Services.

To deal with this problem we have here as witnesses Dr. Forest S. Tennant, Jr., former Chief of the Special Action Office for Drug Abuse of the U.S. Army in Europe, the 7th Army, and Mr. David O. Cooke, Deputy Assistant Secretary of Defense, who is now in charge of the problem of drug abuse of the Department of Defense.

Mr. Cooke is accompanied by a distinguished panel of supporting witnesses who have expertise on different aspects of the problem. The supporting witnesses are as follows: Dr. John F. Mazzuchi; Brig. Gen. W. A. Temple; Col. Frank W. Zimmerman, Mr. David N. Planton; Comdr. S. J. Kreider; Col. Harry H. Tufts; Wayne B. Sargent; and Col. John J. Castellot.

Gentlemen, to save time, I would suggest that you all rise and be sworn at one time, if you will.

Will you raise your right hand?

Do you solemnly swear that the evidence you give in this hearing shall be the truth, the whole truth, and nothing but the truth, so help you God?

ALL WITNESSES. I do.

Senator THURMOND. Let us have a seat.

Our first witness will be Dr. Forest S. Tennant, Jr.

Since I notice that you have stated your qualifications in the opening paragraph of your testimony, Dr. Tennant, I think we

will try to expedite it by asking you to proceed with your statement at this point. You may proceed, now.

TESTIMONY OF DR. FOREST S. TENNANT, JR., M.D.

Dr. TENNANT. Thank you very very much, Mr. Chairman. I am delighted to be here. My name is Dr. Forest S. Tennant, Jr. Between October 1968 and January 1972, I served as a medical corps officer in the U.S. Army, Europe. The majority of my service was spent with the 3d Infantry Division where I helped initiate some of the first drug and alcohol rehabilitation efforts developed in the Armed Forces. During the last 4 months of my tour of duty, I was assigned to the general staff of Gen. Michael Davison, USAREUR Commander in Chief, and it was my job to assist in development of drug and alcohol rehabilitation and prevention programs throughout the command. Since 1972 I have intermittently consulted with U.S. Army, Europe, concerning drug dependence matters, and I returned to West Germany for 6 weeks of Active Reserve duty in late 1972. I am currently a postdoctoral fellow in public health at UCLA. As part of my duties, I conduct research in drug and alcohol dependence, and I currently direct three drug treatment programs and consult with a variety of others in the Greater Los Angeles area.

Throughout my tour of Army duty I conducted a number of studies on the drug problem and much of this research involved hashish, which was the only form of cannabis normally available in the U.S. Army, Europe. I and my colleagues have published several papers on hashish which most have been, or will be, made available to you. Stimuli for our research on hashish was the recurring observation that hashish abuse adversely affected the physical and mental health of soldiers; it impaired combat readiness and capability of our units; and impacted upon military security. These undesirable results of hashish abuse occurred in a variety of ways which I will elucidate during the remainder of my testimony.

Senator THURMOND. Dr. Tennant, when you first went to Europe did you have any preformed opinions, one way or the other, on the potential effects of cannabis use?

Dr. TENNANT. I went there in 1968, and at that time the drug abuse epidemic had not hit its peak, and I knew very little about cannabis, frankly. The only thing I did know was that it was thought to be a rather innocuous drug and a rather harmless drug. And that was the basis of starting my investigations.

Senator THURMOND. Thank you.

You may proceed.

Dr. TENNANT. Before discussing the complications of hashish, it is necessary to establish the difference between the hashish smoked by U.S. Army soldiers and the usual marihuana marketed in the United States. Hashish is the resin of the cannabis plant and marihuana is the whole plant. Hashish normally contains about 8 to 10 percent THC compared to marihuana which contains only about 1 percent THC. A major difference between hashish and marihuana from the medical point of view is the irritating effect

of hashish on the respiratory tract.[1-3] While marihuana smoke is not particularly irritating, hashish smoke is extremely irritating to the nose, throat, and lungs. In West Germany, hashish was very inexpensive, costing only about $1 to $1.50 per gram compared to several dollars per gram in the United States. It was not uncommon for soldiers to smoke 50 to 100 grams of hashish per month. It would require a monthly consumption of 500 to 2,000 stateside marihuana cigarettes to take in the same amount of active ingredient (THC). I was, therefore, in the unusual position to observe some American young men consume massive amounts of hashish, since it was readily available and inexpensive. It was surprising and of great concern that some young men would consume and develop tolerance to enormous doses of hashish that are as yet rarely observed in this country.

I have not been in a good position to observe the long-term toxic effects of normal, street marihuana on young Americans in the United States. During the past 2 years I have enjoyed being the medical director of a free medical clinic in Los Angeles which treats the medical problems of approximately 500 young adults per month. While I frequently observed certain medical and psychiatric problems related to chronic hashish abuse among American soldiers in West Germany, I have observed few complications of cannibis smoking in my clinic in Los Angeles. It is my opinion that, in contrast to soldiers in West Germany, this has been due to the low quality of street marihuana found in the United States and short-term consumption of most young people. Based on my clinical experience and many reports in the literature, however, I would not expect us to see an epidemic of complications of street marihuana for a few years. Given the reports presented before this subcommittee and the fact that chronic use of cannabis is spreading in this country, it would be reasonable to expect an epidemic of cannabis complications within a few years similar to what has been observed among our soldiers in West Germany.

My own clinical observations indicate that complications of cannabis follow a dose-response curve; that is, higher doses taken over a given period of time may elicit a more significant biologic response. I suspect that much of the controversy involving cannabis, particularly among the laiety, is due to failure to understand a dose-response curve. An understanding of a dose-response curve for cannabis, as with any other drug, allows a scientific understanding of most of the reports in lay and scientific literature that initially may appear at variance with one another. As I progress through my presentation, I will frequently refer to dose-response principles.

Between 1970 and 1972 I surveyed U.S. Army soldiers three times by anonymous questionnaire to determine the prevalence of drug use and predict trends. Table 1 shows the drug prevalence of hashish, amphetamines, and opiate drugs among 5,044 subjects. This survey

[1] Tennant, F.S., Jr., et al.: "Medical Manifestations Associated With Hashish." Journal, American Medical Association 216:1965–1969, 1971.
[2] Henderson, R. L. and Tennant, F. S., Jr.: "Respiratory Manifestations of Hashish Smoking." Archives Otolaryngology 95:248–251, 1972.
[3] Tennant, F. S., Jr., et al.: "Hashish Bronchitis." Journal, American Medical Association 217:1706–1707, 1972.

was conducted in the last half of 1971. The survey was conducted by assembling 26 battalion-size units from 11 U.S. Army kasernes in the post theater-auditorium and letting each subject fill out the questionnaire anonymously. On this basis, 35.4 percent reported they had used hashish in West Germany at least one time. A total of 14.8 percent reported they used hashish one or more times per week. I believe this questionnaire study to be fairly accurate since random spot urine tests of 27,000 USAREUR soldiers during this same time period showed the prevalence of abuse of amphetamines, barbiturates, and opiates to be the same as did the questionnaire study: 1.04 percent by urine test compared to 1.3 percent by questionnaire—$P=NS$.[4]

One of the factors that has made it difficult to evaluate effects of cannabis is that it is simultaneously consumed with alcohol, tobacco, and/or other illegal drugs.[5] [6] In the study of 5,044 subjects, about 25 percent reported use of two or more illegal drugs while about 10 percent reported use of three or more illegal drugs—figure 1.[7] Multiple drug use was apparently quite prevalent in this population before Army induction—figure 2. Approximately 50 percent of the total population reported use of at least one drug—including alcohol—while about 20 percent reported use of two or more drugs—including alcohol—before Army induction.

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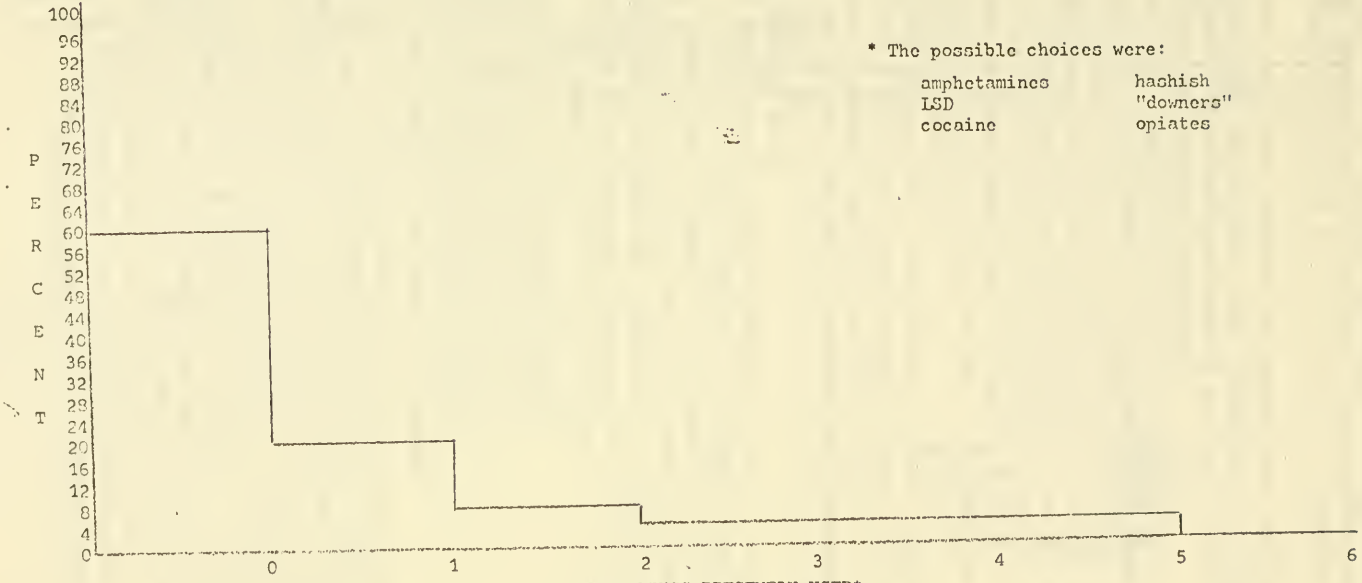
[4] $P=NS$ signifies in statistical language that this is not a significant difference.
[5] $P=NS$ signifies in statistical language that this is not a significant difference.
[6] Pendergast, T. J., Jr., Tennant, F. S., Jr., et al.: "Drug Use and Its Relations to Alcohol and Cigarette Consumption in the U.S. Military Community of West Germany." International Journal of Addiction 8, Fall, 1973.
[7] Tennant, F. S., Jr., et al.: "Psychiatric Effects of Hashish." Archives, General Psychiatry 27:133-136, 1972.

FIGURE 1

FREQUENCY DISTRIBUTION OF PRESENT ILLEGAL USE OF DRUGS REPORTED BY TOTAL POPULATION OF 5044 SUBJECTS



* The possible choices were:

amphetamines	hashish
LSD	"downers"
cocaine	opiates

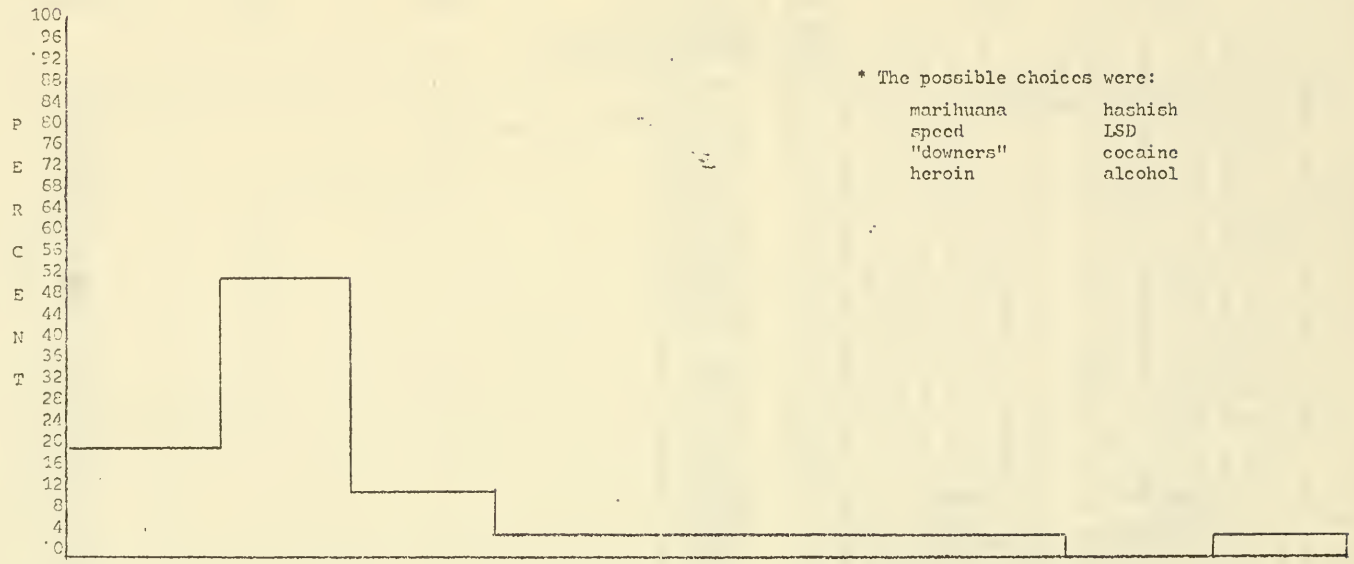
Frequency	2939	1059	422	235	182	130	77
Percent	58.3	21.0	8.4	4.7	3.6	2.6	1.5
Cum Pct	58.3	75.3	86.3	92.3	95.9	98.5	100.0

Mean = 0.88

NOTE that about 25% use 2 or more illegal drugs.

FIGURE 2

FREQUENCY DISTRIBUTION OF DRUGS BEFORE ARMY REPORTED BY TOTAL POPULATION OF 5044 SUBJECTS



NUMBER DRUGS BEFORE ARMY*	0	1	2	3	4	5	6	7	8
Frequency	962	2585	547	258	175	172	154	85	106
Percent	19.1	51.3	10.8	5.1	3.5	3.4	3.1	1.7	2.1
Cum Pct	19.1	70.3	81.2	86.3	89.8	93.2	96.3	97.9	100.0

Mean = 1.66

NOTE that about 20% used 2 or more drugs before Army induction

The simultaneous use of other drugs, including alcohol and tobacco, with cannabis, is a critical issue in my opinion, and one that must be directly reckoned with in arriving at decisions regarding cannabis.

There are many other studies that report that multiple drug use is very prominent among the drug culture in the United States.

Mr. MARTIN. These facts are covered in figure 1 which you have appended to your prepared statement?

Dr. TENNANT. Yes. And I have also attached to my statement something about the frequency of drug use before Army induction. About 50 percent of all the USAREUR soldiers that we surveyed reported they used at least one drug, including alcohol, before Army induction, while about 20 percent reported the use of two or more drugs before Army induction. Approximately 10 to 15 percent used two or three or more drugs prior to Army induction.

So, therefore, the drug taking habits of the soldiers began long before Army induction.

One of the things that I would like to make a special point of and one that I will cover later in my testimony is that cannabis products are commonly used with alcohol, tobacco, and other drugs, and it is my opinion that this is one issue that has not been directly reckoned with, and one that has not been discussed enough. And I will come back to it.

One of the things that has seldom been done in the cannabis controversy is to ask a large number of cannabis users if the drug adversely affects them. Usually a few cannabis advocates attempt to speak for all smokers. In early 1971 we surveyed 1,018 U.S. Army soldiers by anonymous questionnaires: 492, 48 percent, had used hashish in West Germany. This group of hashish smokers stated that the drug caused the following problems:

1. Bronchitis, 30 out of 492 smokers, 6.1 percent.
2. Sore throat, 122 out of 492 smokers, 24.8 percent.
3. Running nose, 43 out of 492 smokers, 8.7 percent.
4. Diarrhea, 23 out of 492 smokers, 4.7 percent.
5. Headache, 70 out of 492 smokers, 14.2 percent.
6. Emotional problems, 42 out of 492 smokers, 8.5 percent.
7. No bad effects, 205 out of 492 smokers, 41.7 percent.

In addition, 13.9 percent of these hashish smokers stated they had had to visit an Army physician for an ailment caused by hashish. Three percent—3.2 percent—stated they were forced to visit an Army physician five or more times for an hashish-caused ailment.

Visits to U.S. Army medical facilities by hashish smokers for hashish-related complaints became a problem in 1969. Over a 3-year period Groesbeck and I studied the psychiatric manifestations of 720 hashish smokers who sought medical attention at the U.S. Army Hospital in Wurzburg, West Germany which served a population of about 36,000 over this time period. (table 2) A detailed analysis of these cases has been published elsewhere so I will only

relate certain aspects of these cases that particularly relate to job performance and military security.[8]

TABLE 2.—CLASSIFICATION OF 710 HASHISH USERS

No.	Dose per month grams	Frequency use	Reason for medical consultation
392	0–12	1–3 times per week	Respiratory ailment or drug information.
18	0–25	Experimental or occasional	Acute panic reaction or toxic psychosis.
3	10–50	3–7 times weekly	Schizophrenic reaction.
110	50–600	Several times daily	Chronic intoxicated state.
85	10–50	3–7 times weekly	Acute toxic reaction (multiple drug use).
111	25–200	Several times daily	Schizophrenic reaction (multiple drug use).
720	Total		

Source: Doses, frequencies, and reasons for medical consultation of 720 hashish smokers.

Over one-half—392—of these individuals smoked small quantities of hashish and came to us for minor respiratory complaints—sore throat, sinusitis—or for information about the adverse effects of hashish. The other subjects exhibited findings of significant psychiatric disease. One hundred and ten of these patients severely abused hashish by smoking 50 to 600 grams monthly for 3 to 12 months. These men smoked hashish several times per day. Other illegal drug usage was reported as rare or nonexistent in these soldiers. All 110 patients exhibited a personality disturbance which prompted psychiatric consultation at some point during their period of high-dose hashish consumption. Despite variation in overall symptomatology, all displayed symptoms of chronic intoxication similar to those found in individuals dependent on depressant-hypnotic drugs. Major manifestations were apathy, dullness, and lethargy with mild-to-severe impairment of judgment, concentration, and memory. Intermittent episodes of confusion and inability to calculate occurred with high levels of chronic intoxication. Physical appearance was stereotyped in that all patients appeared dull, exhibited poor hygiene, and had slightly slowed speech. So apathetic were many patients that they lost interest in cosmetic appearance, proper diet, and personal affairs such as paying debts, job performance, et cetera. Although violence or overt acts of crime were rare in these patients, they were frequently in social and legal difficulties due to failure to care for their personal affairs.

Also of serious but lesser concern were 21 of these patients who developed acute psychotic reactions which required hospitalization. These types of reactions were common. Table 3 lists the causes of drug hospitalizations to the 10 USAREUR hospitals between January 1971 and June 1972 and many were for adverse hashish reactions.

[8] Guerry, R. L., Henderson, R. L., Tennant, F. S., Jr., et al.: Abnormalities of the Respiratory System in Hashish Smokers. (In press.)

TABLE 3—DRUG TREATMENT AT 10 U.S. ARMY HOSPITALS BY DRUG CATEGORY AND MONTH

	1971												1972					
	January	February	March	April	May	June	July	August	September	October	November	December	January	February	March	April	May	June
Marijuana/hashish	29	38	21	33	38	60	49	35	21	41	22	57	29	20	43	52	37	32
Amphetamines	13	10	9	7	14	11	11	8	7	22	9	18	32	30	32	48	42	74
Barbiturates	6	12	11	5	9	4	19	9	10	13	8	8	4	5	6	4	11	13
LSD (hallucinogens)	78	62	52	47	47	73	51	33	43	45	43	19	17	20	32	34	34	27
Opiates, cocaine	12	15	19	25	29	31	56	66	36	50	28	36	45	42	65	76	57	48
Alcohol	57	88	75	70	64	83	73	67	73	88	85	54	103	88	112	89	103	104
Multiple drug use	44	44	43	37	34	51	75	27	44	56	27	30	41	37	46	33	32	46
Other	8	12	8	4	3	23	4	18	17	11	3	4	7	14	13	6	7	4
Total	247	281	238	228	238	336	338	263	251	326	225	226	278	256	349	342	323	348

Note the number of adverse reactions to hashish which required treatment.

This group of patients points out very vividly the problem of simultaneous use of hashish and other drugs. One hundred and twelve of the 720 patients developed psychotic reactions resembling schizophrenic reactions. They followed consumption of hashish with hallucinogens, amphetamines, or alcoholic beverages. These patients were, for some, long-term hashish abusers who, for 3 to 6 months prior to hospitalization, consumed 25 to 200 grams monthly. Schizophrenic reactions occurred abruptly during their period of drug abuse and all patients at the time of admission to the hospital were psychotic enough to require restraint and observation. Premorbid histories obtained from the commanders of these patients indicated in each instance the presence of progressive psychiatric illness and deterioration of job performance prior to the onset of acute symptoms. All required eventual evacuation to the United States for long-term psychiatric confinement.

Mr. MARTIN. While we are on that point, I think it might be interesting to ask a few questions for the purpose of establishing just how enormous this quantity really is.

According to Professor Paton, when he was here and testified before our subcommittee, 5 to 10 milligrams of THC is enough for the average smoker to get himself a case of cannabis intoxication. And allowing for wastage in smoking, it would work out to about 25 milligrams of THC. Since hashish is one-tenth THC, this would make 250 milligrams of hashish. So that 1 gram of hashish would be enough for four cannabis intoxications.

Does that sound about right for the average smoker?

Dr. TENNANT. I think that is about correct, yes, sir.

Mr. MARTIN. When you get up to the level of 600 grams of hashish a month, you are talking about 20 grams a day, or approximately 2 grams of pure THC?

Dr. TENNANT. That is correct.

Mr. MARTIN. Which is the equivalent of 80 times the amount necessary to produce cannabis intoxication in the average smoker. Now, this is a rate of acceleration that far exceeds any acceleration that I have ever heard of in the case of alcoholics. They may start out as relatively heavy drinkers, taking a third of a bottle a day, let us say, half a bottle a day, and over a period of many years they will slowly move toward a bottle a day, a bottle and a half a day. But they do not go much higher than that. They may increase their intake about fourfold, sixfold, from the time they first begin drinking heavily on a regular basis.

But in the case of these hashaholics you were talking about, they were able to increase their intake of cannabis—apparently over a relatively short period of time—eightyfold or a hundredfold?

Dr. TENNANT. That is absolutely correct. And it was rather astounding for us to find this out.

Let me just say that smoking 600 grams a month was a rare situation. It was very common for someone to smoke 50 or a hundred grams of hashish a month. And initially the soldiers would explain to us that when they first started smoking hashish in Germany they would smoke no more than one or two puffs of hashish. But over a

period of just a few weeks they could build a very rapid tolerance to the drug.

Mr. MARTIN. Would it be accurate that some of those that became hashaholics had not even smoked marihuana before they came to Germany? Or had most of these done some smoking before they came to Germany?

Dr. TENNANT. Based on our surveys, the majority of them had smoked some marihuana before they smoked hashish in Germany.

Mr. MARTIN. Were they chronic marihuana smokers before they came to Germany? Were they at the once a day level or the once a week level?

Dr. TENNANT. I do not have that precise information. Many of them were, and some were not.

Mr. MARTIN. Presumably, some of them were only casual smokers who took one joint a week or several joints a week?

Dr. TENNANT. Yes.

Mr. MARTIN. And they progressed from this level in a period of what time?

Dr. TENNANT. According to what they would tell us, they could go from a level of smoking one or two stateside marihuana joints up to a level of 25 or 50 grams of hashish within a period of 3 months. They obviously developed a tolerance to the drug very rapidly.

Mr. MARTIN. Now, when you get up to the level of a hundred or 200 grams a month, even allowing for the much cheaper price of hashish in Germany, you have reached a point where the ordinary GI cannot afford that much without some special source of income. Where does he get the money?

Dr. TENNANT. Of course, different people would get it from various places. But we had many cases—and I would like to relate some anecdotes later in my testimony—who would get into illegal behavior to support this habit. And, of course, many soldiers went into the hashish-dealing business. This was quite common. Other soldiers would say that it would be possible to smoke 25 or 50 grams a month simply by borrowing from other soldiers. But without question, many of them did get into illegal activities in order to support this type of consumption.

Mr. MARTIN. The requirement for this kind of money would obviously make them security risks?

Dr. TENNANT. Very much so.

Mr. MARTIN. Again you talk about overt acts of crime, are you talking about violent crime?

Dr. TENNANT. Yes, sir. But not directly caused by pharmacologic effects of the drug.

Mr. MARTIN. For example, you just said a while ago that many of them went into selling hashish and other criminal activities?

Dr. TENNANT. Let me qualify "other criminal activities" a bit.

Rarely in our experience did we see these people who were chronically intoxicated commit violent crime. In other words, they were very seldom involved in assaults or beatings or anything like this. But they were always in other kinds of difficulties.

Mr. MARTIN. Nonviolent crimes?

Dr. TENNANT. Nonviolent type activities, or illegal activities, let us say. It was very frequent.

Attached I have a list of hospitalizations of people who required treatment while I was in the USAREUR Command between 1971 and up through June of 1972. Many people—and I pointed this out—many people state that if you smoke hashish or marihuana, it will never result in hospitalization because the drug is harmless. But our data in USAREUR does not support this belief. We had many admissions each month to our ten hospitals, which showed that there were a number of hashish-caused hospitalizations.

And to go right along with this, the recent DAWN (Drug Abuse Warning Network) data—which is the information system established here in the United States, of which I have been one of the major consultants during the past year—shows that out of the 800 reporting hospitals that report to the IMS Company in Philadelphia each month, there are a number of hospital admissions and emergency treatments that are required in the United States for marihuana and hashish abuse. So, apparently, the same thing that we saw in the U.S. Army, Europe is beginning to occur in the United States. This information, of course, is not publicly known, because generally the lay press only reports information that generally states that nobody gets sick if they use marihuana. However, there is quite a body of data accumulating in the DAWN system which shows that that is not the case in the United States at this time.

To perhaps better emphasize the problems that we saw with hashish and job performance and military security, I would like to pass on a few anecdotal reports from my own files. And I emphasize that these are cases out of my own records, and they are not hearsay. I did not take them from someone else; they were my own cases. They point out a lot of problems that we observed with hashish abuse.

Number 1, AJ, a 19-year-old soldier, according to his roommate sniffed two bottles of cleaning fluid; drank a fifth of bourbon; smoked four bowls of hashish and expired.

2. JM, under the influence of unknown quantities of alcohol and hashish, took an axe and killed his German girlfriend by literally chopping her into several pieces. The following morning he claimed he did not remember the incident.

3. Three soldiers, under the influence of hashish, raped a 15-year-old dependent girl. All three soldiers blamed the incident on hashish.

4. SG, under the influence of hashish and strawberry wine, one evening stole several soldiers' belongings such as stereos and wristwatches. The following morning he did not remember the incident. Furthermore, he claimed he had never stolen before and he was recognized as a model soldier by his superiors. He had no use for the items and returned them to their owners.

5. A frequent occurrence is illustrated by CN who, under the influence of hashish and alcohol, sliced his wrists in a suicidal gesture.

6. This report points out some of the implications of crime and violence that are indirectly related to the consumption of hashish—

one barracks in my division became known as "Smoky Barracks" because it was a well-known supplier of hashish. Many violent acts occurred in these barracks which were related to hashish dealing. To the best of my knowledge, five to six soldiers commandeered the hashish dealing. Failure to pay a drug bill for as little as $10 or $20 resulted in violence. Since I was the surgeon who had to care for the victims of the violence, I became involved and knowledgeable. The usual violent act was a "blanket party" which occurred when the attackers would find the victim asleep. They rolled him up in his blanket like a hot dog and physically assaulted him with fists and clubs. On two occasions soldiers were thrown from a two-story window because they failed to pay a hashish bill and in one instance, a soldier's wife was beaten for a deficit of $60.

7. Some of the fights and incidents between blacks and whites which occurred in U.S. Army, Europe, in 1970 and 1971 and were labeled "racial incidents" were, in reality, fights over who would control the local hashish franchise.

Let me emphasize that the above anecdotal reports do not prove that hashish caused them. They do, however, dramatically point out some issues and call for a note of caution concerning cannabis. First, they emphasize potential problems related to security for the U.S. Army.

Second, these cases illustrate how cannabis is commonly used in real life. It is a drug that is seldom taken in isolation. It is usually simultaneously consumed with other drugs, particularly alcohol. Even in the United States, marihuana is usually passed around at parties after alcohol has been consumed. As illustrated by the above anecdotal reports, it is impossible to tell whether the tragic events occurred as a result of a disturbed personality, alcohol, hashish, or a combination. One thing is certain, however, cannabis effects must be considered in light of its simultaneous use with alcohol. Most experiments and research conducted on cannabis in recent years have not taken into consideration that cannabis is usually not consumed in isolation from other drugs. At present it appears to me that we need considerable research on the effects of simultaneous use of cannabis and other drugs, particularly alcohol.

Mr. Martin. A question at this point, Dr. Tennant. Is it your impression that when someone takes cannabis and alcohol, the total effect is a kind of arithmetical sum of the effects of the two drugs—or do they have a synergistic, or compounding, effect, so that you get an aggravated reaction by taking the two of them?

Dr. Tennant. From purely clinical observations, there is usually a compounding effect, or potentiating effect, as it is referred to in toxicology. In other words, not two and two equals four, but two and two equals six; this type of effect. At least this is what you see clinically when these two drugs are consumed. I have frankly not seen good basic research to really clarify these points. If the research exists, I do not know about it.

I would also like to mention a little bit about the impairment of driving by cannabis intoxication. There have been many studies which point out that cannabis can impair driving.

I saw many accidents that appeared to be related to hashish consumption. Although most were minor and did not take a life, the following two reports from my own files were tragic:

1. KS, under the influence of hashish, drove his motorbike under a truck and decapitated himself. His roommate said he made a usual practice of smoking hashish while riding his motorbike.

2. A 2½-ton truck carrying several soldiers drove over a cliff, while attempting to make a turn. Eight soldiers were killed. My investigation revealed, via information from soldiers who were not killed, that the driver smoked two pipebowls of hashish about 1 hour before driving.

The above two incidents point out the potential problem of U.S. Army soldiers operating equipment, flying, etc. under the influence of cannabis. To complicate matters there is little way to detect an individual when under the influence of the drug and there is as yet no reliable, routine laboratory test to detect THC in the urine, breath, blood, or saliva.

Mr. MARTIN. A question at this point, Dr. Tennant, rather than coming back to the point later on.

Have you heard a tape recording, a very dramatic tape recording, prepared by Dr. Joseph Davis of the University of Miami Medical School? It involves a young cannabis driver who had smoked 2½ joints, and a student—a friend—who acted as a control, and has the tape recorder beside him in the car.

Dr. TENNANT. I have not heard the tapes. I have read a transcript of these recordings. And they are quite dramatic. I think they are probably more dramatic than you would normally see in the case of an individual who was intoxicated with any drug. But I think his particular reports certainly points out that people who are intoxicated with cannabis or any other drug are not going to be able to drive properly.

Mr. MARTIN. I have here a few excerpts from the transcript which suggests to me that the net impact is probably qualitatively different from the impact we get from a simple alcoholic drunk. I would like to read these few excerpts to you.

The driver said:

I now feel my head vibrating in between two and three different people. I have forgot to look one way when I rounded that corner. I went into third gear very, very poorly, possibly the worse that I have done in my entire life. I am coming to a stop sign. For some reason I feel maybe I won't be able to stop. It is difficult to force my foot down to the floor on the brakes. It seems as though both of my feet are riding on cushions, the cushions between my feet and the brake pedal.

And then after a while he says:

I am very frightened of cars passing me. I just did a totally mechanical action. I don't know why I did it. I just feel that if I could lift my foot off the brake I would just go zooming around the world.

And then a bit later:

I just can't handle this thing any longer, because I feel like I am going around the end of the world.

And then a little later:

Let me explain something. I was upside down driving and it is happening again. And I have got to say something. I can't possibly drive now, no matter

what anyone does to me, because I am driving on my head. You know, driving isn't good when you are upside down.

I have to get off the road. My God, what is happening?

I don't know, I have driven cars a few times, I will confess, when I have had one or two too many drinks. I have been with some people who have been driving who have had a few too many drinks. But I can recall, quantitatively, no reaction quite comparable to this. This guy was hallucinating; his mind was not simply fuzzed up.

Dr. TENNANT. I think perhaps that incident may point out that alcohol is primarily a depressant, but with cannabis you essentially get psychotic symptoms with a toxic dose, in which case you may have delusions, or you may be confused, or you may hallucinate. This is well documented in many reports. It sounds like this is what happened in this particular incident.

Mr. MARTIN. The clincher here, which comes at the end of Dr. Davis' commentary, is that when the car was stopped by a traffic policeman, the control and the cannabis-intoxicated student simply changed positions. And the traffic policeman was not aware, he simply had no knowledge, that this car which has been behaving so strangely had been driven by a student who was intoxicated with cannabis.

Dr. TENNANT. I would certainly like to add to this that I think one of the biggest problems from a public health point is the driving problem with cannabis. One of the big dilemmas that we are in is that we have no reliable, inexpensive routine test to detect THC or cannabis products in the urine, breath, blood, et cetera. And, therefore, there is no way to accurately detect, for example, for the routine community or Army post, whether someone is intoxicated with cannabis, because we just do not have a laboratory test that is readily adaptable at this time. It is strictly a research procedure at the moment.

Mr. MARTIN. One more question. Would not the same considerations apply in even greater degree to soldiers who are operating expensive or complicated equipment of any kind?

Dr. TENNANT. Most definitely.

Mr. MARTIN. Trucks, artillery equipment, nuclear weapons, guidance systems—everything?

Dr. TENNANT. There is no question about it. And I think this is a prime danger that we have with cannabis products in the military. Almost everyone in the military services must operate a mechanical tool or mechanical vehicle of some type. And, therefore, you simply cannot afford to have, with our advanced technological vehicles and equipment, people that are intoxicated on any drug and who operate equipment.

Mr. MARTIN. And from your experience, is it not logistically a much simpler thing for a GI to hide a few marihuana joints in his pocket, or a little bit of hash in his pocket, and sneak off for 15 minutes and get himself a cannabis high, and then come back to his job, than it is for him to hide a bottle of whiskey and then sneak away long enough to get himself really stoned?

Dr. TENNANT. Absolutely. In fact, this was, when I was on active duty, one of our biggest problems, because the sergeant or the com-

pany commander would walk down to the motor pool in a field operation and find people intoxicated because they had been able to bring hashish into the working area.

Mr. MARTIN. Which they would not have been able to do with whiskey?

Dr. TENNANT. No, soldiers cannot bring a six pack into the area as easily as hashish. And they would get noticeably intoxicated.

Mr. MARTIN. Proceed.

Dr. TENNANT. One of the other things that came to our attention from a medical point of view in 1969 and 1970 were respiratory problems that were related to hashish consumption. We have reported these findings in several reports. And I will not belabor them, except to say that we found that sinusitis, pharyngitis, and bronchitis were extremely common among these heavy hashish smokers. And this is rather surprising, because even though you can get bronchitis and emphysema and these sort of problems from cigarette smoking one usually must smoke cigarettes for 10–20 years to get these complications. We became alarmed about this because we began seeing these complications in 18, 19 or 20-year-old men.

One of our major concerns whether hashish may also lead to cancer as does cigarette smoking. To this end I and two other U.S. Army physicians began a study in 1971 which involved bronchial biopsies of 36 male, U.S. soldiers age 17 to 36—mean age 21 years. My colleagues in this effort were Maj. Roderick Guerry, MC who is now a pathologist at the University of South Carolina and Lt. Col. Robert Henderson MC who is an otolaryngologist and still stationed at the Wurzburg, West Germany, U.S. Army Hospital where this work was done. Much of the work was done after I left, but the three of us have coordinated the effort since 1971. A paper has been written, and I am making it available to you.[9]

The subjects were as follows:

Hashish and Cigarette Smokers	23
Hashish (No Cigarettes)	7
Cigarettes (No Hashish)	3
No Cigarettes orHashish	3

All 30 hashish smokers smoked over 25–50 grams per month and all had clinical findings of chronic bronchitis. Twenty-four of the 30 had abnormal bronchial biopsies.

Among the six nonsmokers of hashish only one had an abnormal bronchial biopsy—was 32-year old cigarette smoker.

The abnormalities found in the bronchial biopsies were the same that are associated with heavy cigarette smoking and cancer of the lung.

Our data suggests that the abnormal lesions found in these subjects and which are associated with cancer of the lung are more likely to occur in people who smoke both cigarettes and hashish than with either smoked alone.

Mr. MARTIN. And how long, again, had these men been chronic cannabis smokers?

Dr. TENNANT. Just a few months.

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[9] Tennant, F. S., Jr., et al.: Effectiveness of Drug Education Classes. American Journal Public Health, 64:422–426, 1974.

Mr. MARTIN. When you say long-term cigarette smokers, what period of years are you talking about?

Dr. TENNANT. Generally speaking, it takes, from the studies that have been done, about 5 to 20 years to develop precancerous lesions in the lungs from cigarette smoking alone.

Senator THURMOND. You are talking here about chronic cigarette smokers, who smoke a pack a day or more?

Dr. TENNANT. Yes, sir.

Senator THURMOND. And with the chronic hashish smokers, as much change took place in 3 months as you would normally find in chronic smokers who have been smoking a pack or more a day for many years?

Dr. TENNANT. That is right.

Senator THURMOND. Those are very impressive figures.

Dr. TENNANT. Now, the interesting thing about this is that we had 7 of these 30 smokers that did not smoke cigarettes, they only smoked hashish. And two of these seven had these precancerous lesions. You might say only two out of seven is not very many. But you have got to realize that you do not normally find this particular lesion unless you have smoked for a long time.

Now, the other thing about this study, we had 23 people who smoked both hashish and cigarettes. And all of these people had abnormal lesions in the biopsies. And, therefore, our conclusion, at least based on our evidence, is that it would appear that people who smoke both hashish and cigarettes develop these precancerous lesions at an amazingly early age, and that smoking hashish alone may cause this also.

These findings, I think, would lend some credence to one of the reports that has come before this hearing, the study of Leuchtenberger of Switzerland. This would certainly go along with her data.

Mr. MARTIN. Presumably, Dr. Tennant, you are making copies of these studies which you are going to make available to the subcommittee for publication as appendices to the record?

Dr. TENNANT. Yes, sir.

Mr. MARTIN. If that should be the decision of the subcommittee.

Dr. TENNANT. Yes, sir.

Mr. MARTIN. Thank you very much.

Dr. TENNANT. I would now like to move to another subject. And that is the benefit of education about cannabis. And some of our efforts in U.S. Army, Europe to attempt to deal with the problem in this area.

I must say that beginning in 1969–70 various commands within the USAREUR Command began to attempt to use all types of education efforts to stem the tide of cannabis and other drug abuse. And beginning in 1971 the USAREUR Command started making a tremendous effort in this area. And many things were tried. In fact, everything imaginable was tried, from the traditional films and sermons from the pulpit to actually publishing literature that essentially took the attitude, if you are going to smoke hashish, at least smoke it right. And we actually officially published material that actually taught them to smoke it, and to smoke it the safest way, because we became rather desperate because, we found nothing else that seemed to be stemming the tide.

We conducted one study of 947 soldiers to determine if drug education classes given by knowledgeable authorities were effective in reducing use and abuse of hashish and other drugs. These subjects were surveyed by anonymous questionnaire to determine drug-use prevalence at the time of the classes and then again at 3 months following the classes to see if drug-use prevalence changed following the classes. Drug-related hospitalizations among these subjects were also monitored beginning 1 year before the class to 1 year afterward. The effect of the classes on hashish use was slight, with about 80 percent of hashish users maintaining their same hashish habit following the class. About 15 percent of subjects reported they decreased or stopped hashish as a result of the class while 5 percent reported they started or increased hashish use as a result of the class.

Prior to these hearings, I basically stood on the opinion—based on our studies—that education efforts to reduce cannabis use had equivocal and possibly even detrimental value. So much new and well-done research now indicates to me, however, that we have enough solid information about the deleterious effects of cannabis to reconsider education efforts. In the past, all we have been able to offer in the way of cannabis education has been psychiatric reports. These have not been impressive to the target population. Considering that the evidence now strongly suggests that cannabis may lead to lung disease, brain disturbances, suppression of the immunologic system, testicular suppression, and possibly even cancer, I feel we have a responsibility to inform members of the armed forces about the possible consequences of cannabis. This information may have a significant effect just as did information about the possible complications of LSD.

Mr. MARTIN. You are talking about the series of hearings that the Subcommittee on Internal Security has just conducted?

Dr. TENNANT. Yes.

From reading the testimony that has been presented here, there appears to be so much new and well-done research that my opinion has perhaps been altered. I think that we perhaps now have enough good research data about the deleterious effects of cannabis to perhaps reconsider our education efforts in the cannabis area.

In the past all we have really been able to offer in the way of cannabis education has been to relate some psychiatric reports and to tell them that it is illegal and that we do not like it. Short of that we really have not had much to say. And this type of education has not been very impressive to the target population, which is the young military man.

I would throw up a note of caution, here, however, in that perhaps we should attempt to give the facts as they were reported here.

I would like to cover one other area now that I think is very important. And it is a study that I have spent almost 3½ years on, and which has just recently been completed at UCLA.[11] In the last half of 1971 I mentioned that we surveyed slightly over 5,000 Army soldiers in U.S. Army, Europe. The reason why we conducted this

[11] Tennant, F. S., Jr., Childhood Antecedents of Alcohol and Drug Abuse. Doctoral Dissertation, UCLA School of Public Health, 1974.

survey at that time was not to really determine how many people were taking drugs—that was only a secondary goal—our primary goal was really directed toward prevention. It became obvious to me in 1971 that education was not working, prevention was not really working, and treatment was not working very well. And law enforcement efforts were not working very well. Therefore, I felt we had to explore a new area. And that was to perhaps attempt to find out something about the childhood backgrounds of drug abusers, and perhaps come up with some events or behavior in early childhood that lead to adult drug taking.

Now, these types of studies have some problems as far as interpretation. But we felt that we had to make an attempt to find out why do some kids become users and some do not.

There is a growing body of evidence that indicates that many destructive—versus constructive—health behaviors such as drug taking, overeating, smoking, alcoholism, accident-proneness, et cetera are primarily developed before age 10 to 12 years.

A childhood antecedent that was striking in this study and the only one that proved to be associated with adult hashish abuse was an early age of initiation of alcohol use. Among these 5,044 subjects about 20 percent reported they began alcohol use before age 9 years.

In this study, childhood antecedents of drug and alcohol abusers were compared with nonusers. Included among antecedents were childhood hobbies, games, outdoor activities, membership in Scouts, school athletics and nonathletic activities, time parents spent in activities, television watching, church attendance, household tasks, monetary allowance, type and frequency of punishment, age of first alcoholic drink, and drinking habits of parents.

The criterion for a significant association between a childhood antecedent and nonuse or abuse required used here was at least a 20 percent difference between the percentage of abusers and nonusers who experienced a childhood antecedent. This criterion was established because a study sample of this size [N=5044] allowed for a difference of a few percentage points between groups to be statistically significant at the $P<.001$ level. Using this criterion, there were no significant associations between any childhood antecedent and frequency of alcohol use. A report of beginning alcohol consumption before age 9 years was associated with hashish abuse while the start of alcohol consumption at age 15 years or older was associated with nonuse of hashish. Spanking by parents and church attendance of over 50 times before age 15 years were the only antecedents associated with nonuse of amphetamines and opiates. Punishment of over three times per week was associatd with abuse of amphetamines and opiates. These associations were found within white and nonwhite groups and among subjects with divorced or separated parents.

Mr. Martin. In talking about drinking, do you know whether they were drinking beer or whiskey or what?

Dr. Tennant. Again, let me emphasize, this was a pilot study, the only one I know that has ever been done like this. And it was a very long study. All we could ask was at what age did you begin drinking?

Much to our surprise, 20 percent of these 5,000 soldiers reported that they began drinking before age 9.

Now to go along with this—it is very interesting—the soldiers who reported they began drinking alcohol at age 15 or older were statistically associated with nonuse of hashish in their adult life.

Now this was the only thing that was associated pro and con with hashish abuse and nonuse.

I would like now perhaps to wrap up my testimony by bringing out a couple of issues and perhaps making some recommendations.

First off, I would like to say that as far as attempting to reduce the use and abuse of hashish in the U.S. Army, Europe, I believe that the efforts there have far exceeded on many fronts the effort that the civilian sector has put out. And I particularly want to make a point of this, since I am one of the few people in the United States who has had an opportunity to see what the military has attempted to do to deal with the drug problem, and what the civilian sector in a very large community has attempted to do with the drug problem. And judging by the malignment that the press has given to the military, I must say, compared to what the civilian sector has done, that that criticism is totally unjustified.

Let me just put it very pointedly. The efforts being made in my county, which is Los Angeles, does not even begin to compare with the efforts that the Army community has attempted to make in Europe.

Mr. MARTIN. Are we not spending a lot of money, that is, isn't the Federal Government spending a lot of money on drug education, on programs around the country—civilian drug education programs, that is?

Dr. TENNANT. Let me say that you are spending a lot of money. And this is one of my—I am glad you brought this out—a very important point with me is that we have several Federal agencies in particular that are giving grants supposedly for drug treatment and for drug education and for drug training programs. I think this money has been misused in many cases, if not the majority of cases. I think that a close scrutiny of where grants have gone would reveal a spectrum that is almost amazing. This spectrum would run from people doing a very excellent job of drug treatment and drug education and drug training, to the other end of the spectrum in which the money is used for totally unrelated purposes—everything from running political campaigns to providing salaries and simply putting it in people's pockets and appropriating it for their own personal use. And you have got a variety in between.

Mr. MARTIN. You are involved, I believe you stated, with three drug educational programs in the Greater Los Angeles area?

Dr. TENNANT. My programs are primarily treatment programs.

Mr. MARTIN. Treatment programs. But you have had contact with the drug educational programs that are operating in the Greater Los Angeles area?

Dr. TENNANT. Very much so. I consult with many. And I think I am somewhat familiar with their operations.

Mr. MARTIN. Those operations do receive funds from Federal sources?

Dr. TENNANT. Yes, some do.

Mr. MARTIN. Do any of them conduct what you would consider to be an effective campaign against cannabis abuse, or do they perhaps tend to take a tolerant attitude?

Dr. TENNANT. Let me put it this way. I do not know of anybody who has been waging a good campaign against cannabis. I do know of a lot of federally funded drug education programs that are doing an awfully good job of encouraging cannabis use.

Mr. MARTIN. That is not what they got this money for, Dr. Tennant.

Dr. TENNANT. That is not what they said they got the money for. They have even been led to believe in some cases that that is what the Federal Government wants.

Mr. MARTIN. You are talking about drug educational programs with which you have had personal contact?

Dr. TENNANT. Yes, sir.

Mr. MARTIN. And this is based on your personal experience?

Dr. TENNANT. Right. And without mentioning names or attempting to slander anybody, let me just say that I think the time has come that we need a very close scrutiny of drug grants. I think that someone somewhere needs to take a very serious look at drug grants given out of the Office of Education and out of NIDA, as to what that money has been spent for; who those grants went to; to what kind of people received the grants and to what really was being done with the money. I can make one statement, I think, without a lot of reservation: most Federal grants for drug money in the last 3 or 4 years have been given with essentially no requirement of accountability.

And I do know, incidentally, that Dr. Dupont and his people are making some efforts in this direction. But I think there is a lot more that has to be done.

Mr. MARTIN. Dr. Tennant, I do not know whether you are in a position to provide for the record some of the names of the drug education organizations, or setups, that in your opinion are actually encouraging marihuana use rather than conducting a campaign of education against cannabis abuse. If for some reason you cannot provide them for the public record, would you be prepared to provide the names of these organizations or committees for the information of the subcommittee?

Dr. TENNANT. I would not be prepared to present them in this room. But I would be glad to privately.

Mr. MARTIN. You can give them to us after the hearing, Dr. Tennant?

Dr. TENNANT. That would be my preference, yes.

Mr. MARTIN. Thank you.

Dr. TENNANT. I would like to mention a couple of other issues. I would like to mention very briefly something about security clearances and cannabis. That has been a very difficult problem for the Armed Forces. And I would basically like to relate what I did as a medical officer who had to review security clearances and what I recommended to my commanders.

The use of cannabis was so widespread, as were drinking problems, that we had to reckon with both of these things in granting security clearances. And here was our policy—whether it was a

right or wrong policy I do not know, but we had to come up with one at our level that was a workable policy. And I offer it only for information's sake, and not necessarily as a recommendation, even.

Our policy was that if someone had a drinking problem or was a known cannabis user, that on occasion they would be granted a confidential security clearance. It was our policy that anyone with a drinking problem or that was a known cannabis user would not be given a secret or top secret clearance, and certainly no one was given a nuclear clearance in my unit who was identified in either one of these categories.

Mr. MARTIN. Did you ever have to deal with the problem of an officer or enlisted man who perhaps had been given a secret or top secret clearance, or a nuclear weapons clearance, and who was subsequently found to be constantly intoxicated on hash, so that his clearance had to be withdrawn?

Dr. TENNANT. On rare occasion; yes, sir. This came about—I can think of a half a dozen times over a 3-year period within my division. But it was not a common occurrence. Frankly, most of these people who really smoked cannabis heavily became identified rather soon, because their job performance deteriorated so rapidly.

I would like to cover one other area. Perhaps I as an ex-officer, can talk about programs easier than can some people who are active officers. And this is the problem—and I emphasize the problem—of discharges for drug abuse from the Armed Forces.

Discharges for drug abuse from the military should, in my opinion, be changed. In simple context, we basically have two types of discharges: 1. those who receive veterans' benefits; 2. those that do not provide benefits.

These two categories exist whether the discharge is labeled as honorable, dishonorable, general, undesirable, unsuitable, et cetera. When it comes to discharges for drug abuse, the two basic categories—veterans' benefits versus nonbenefits—have been a demoralizing factor on the U.S. Army—and I assume other branches of the military—unit because it rewards the drug user with the same veterans' benefits as it does the dedicated, nondrug using soldier. As you are aware, a discharge for drug abuse now warrants full veterans' benefits including hospital care, home loans, and education supplements. Our current discharge policy violates a basic tenet which has been known by social scientists for centuries: "If you reward or ignore maladjusted behavior, the behavior gets worse."

Those of us who treat drug-dependent individuals as an avocation base our treatment on confronting maladjusted behavior and rewarding positive behavior. Our current discharge policy for drug-abuse not only does not deter drug use, it may actually encourage it. My files contain literally dozens of cases of U.S. Army soldiers who requested A.R. 632–212 discharges for unsuitability for drug dependence for the main purpose of leaving the Army and attending school with veterans' benefits. I do not think I exaggerate when I say that I think our discharge policy for drug abusers did as much to undermine the combat readiness and interfere with security of my units as did any other single factor.

I recommend a discharge regulation for drug-dependent persons to contain the following points: 1. Discharge termed neither honorable nor dishonorable; 2. No way to identify the individual as a drug abuser; 3. The only veteran benefit is treatment for drug abuse—no other medical care; education benefits, etc.

If we had such a discharge policy, I believe it would be fair to the individual; it would not encourage drug use; and it would not hinder combat readiness and interfere with security.

Two areas have emerged from my work which require progressive and concentrated research. One is the effects of cannabis when consumed with alcohol, tobacco, and other drugs. The second is the effect of consumption of legal drugs—alcohol, tobacco—by preadolescent individuals on their drug-taking patterns in later life. Present evidence, although inconclusive, indicates that the consumption of these substances by preadolescents is directly or indirectly related to abuse of hashish and other drugs in adulthood.

The time may be fast approaching to seriously consider how to revamp the system to deliver alcohol and cigarettes to the public in such a manner to effectively keep these substances from preadolescents—to say nothing of keeping them away from under-the-legal age—18—adolescents. It appears somewhat incomprehensible to consider legalization of cannabis when we cannot deliver our present legal drugs—alcohol, cigarettes—so that children under age 10 cannot consume them to the extent they currently do. Although the withholding of alcohol and cigarettes from children may not prevent adult drug abuse, current evidence suggests we must eventually make an effort to educate the public about possible hazards of early age drinking and smoking.

Mr. Chairman, this concludes my rather lengthy and involved report. And I appreciate the opportunity to deliver it. I would be delighted to answer any questions.

Mr. Martin. I have a few questions that I would like to ask Dr. Tennant, Mr. Chairman.

In your testimony, Dr. Tennant, you referred to a number of questionnaire surveys on cannabis abuse which were conducted at different times with different results. In conducting such surveys, would not the results vary considerably, depending on the phrasing of the questions, whether or not the questionnaires were distributed by mail or distributed live to an assembly of servicemen?

And finally, would they not also depend on the skill of the officer in charge of the questionnaire survey?

Dr. Tennant. Very much so. When we started out doing questionnaire studies in 1969, there was essentially no one around that knew how to do it. And we did some preliminary studies in which we completely boggled the whole thing. They just gave us meaningless data because we did not know how to ask the questions, and we did not know how to do it, and there were a lot of problems. And there was nothing in the scientific literature to give us a lot of guidance. Epidemiologists really had not gotten into this area.

We learned that there were certain ways that you had to ask questions and a certain methodology that seemed to work. And it has been very interesting that the methodology that I, and prin-

cipally Dr. Tom Pendergast, who is now an epidemiologist at the University of Missouri, used. He and I over a year and a half's time developed a method by which we thought we got some fairly accurate responses. And it has been interesting that these techniques have been essentially the same techniques that people have had good success with in school systems. And so, therefore, it is generally thought, I believe, in the epidemiologic field that there are special ways and methods that have to be used if you are going to conduct studies on drug dependence or alcohol dependence.

Mr. MARTIN. Were all of your questionnaire surveys conducted live, or were any of them conducted by mail, or do you know of any that have been conducted by mail in the armed services?

Dr. TENNANT. When I was just about to leave active duty there was a large mail survey I know that was on the drawing board, and I frankly do not know what happened to it. Based on what we know, that will not get an accurate response.

Mr. MARTIN. Why will it not get an accurate response?

Dr. TENNANT. For a variety of reasons. We know that, for example, if you mail questionnaires to, say, physicians, you only get a 55-percent return. And this is a fairly intelligent group who usually are fairly well motivated. So you get a very poor return, number 1.

Second, I think it takes a lot of ability to fill out a questionnaire and put in the mail and then mail it back. It is much more difficult than it is to just give it to someone and supervise them when they are sitting there filling it out.

So I cannot imagine that you would get very good responses out of a mail type questionnaire. And I know of no one who has done such a study in the United States who felt good enough about his data to publish it.

Mr. MARTIN. Your surveys suggest that toward the end of 1971 you noticed what appeared to be a marked improvement in the situation, as far as cannabis consumption was concerned. Now, you went back to Germany, I believe, in late 1972 on reserve duty. Did you see anything at that time which appeared to suggest that the trend was still continuing, or that we were making some progress in curbing the cannabis epidemic?

Dr. TENNANT. I was very intrigued by finding that between our surveys done in late 1970 and early 1971 that they showed that something like 16 percent were using hashish over 3 times a week—that this had dropped to about 10 percent, according to surveys right at the end of 1971, over about a year and a half time. And I have seen some survey data—I do not know how the survey was conducted—that shows that perhaps this may have dropped off a little bit even since.

Mr. MARTIN. When you say "since," do you mean 1974 or 1972?

Dr. TENNANT. 1972, 1973 and 1974, after I left active duty and was no longer doing the surveys.

When I returned in late 1972 I did not do any epidemiologic surveys. And I talked to a few soldiers, but that is not a very good way to assess what is going on. You can only talk to a few people, and that gives you a very small sample; a very biased sample. And that is not a very good way to do it. You really have

to sample a lot of people using a known method in order to get an idea of the prevalence of drug use.

Mr. MARTIN. Since you visited Germany there has been a rather important change in the composition of our armed services. They have gone over to a volunteer basis. And the volunteer Army, of necessity, is unavoidably recruited—heavily recruited—from the lower economic strata of the population. Would that not create an entirely new situation, a situation which calls for a careful study to find out in what manner the volunteer composition of our Armed Forces has affected the problem of drug abuse?

Dr. TENNANT. I do not think there is any question about that. I could name about four or five different factors or variables right now that might make differences in the prevalence of drug use. And one of them is, what has the volunteer Army done?

Let us take U.S. Army, Europe, for example. You have also got to consider the fact that they have quite a good drug treatment program. They have good police efforts. They have a very positive attitude toward controlling the problem. I do not know exactly what has happened to availability of the drug. I see all those factors possibly contributing to the drop in prevalence. And it was my contention that soldiers are starting to become very leery of very heavy use of cannabis, and that this has also been a factor.

The point I am making is that the only way I would know what is going on now would be to see good epidemiological data from surveys that were conducted in an appropriate way at this time. Otherwise, I really do not know what is going on. And I would like to see that kind of data before I could make an assessment.

Mr. MARTIN. Professor Hardin Jones, in the testimony which he gave our subcommittee in executive session, made the point that when people are inducted into the Armed Forces, or when they join the Armed Forces as volunteers, they do not change—by and large, they bring with them into the services both the strong points and the weaknesses which characterized them as individuals in their civilian life. Would you agree with that hypothesis?

Dr. TENNANT. Absolutely. In fact, I would even go one step further. The growing body of evidence—and I alluded to this earlier—would indicate that to a great extent deviant behavior, deviant psychiatric behavior or destructive health behavior, are pretty well formed in an individual by age 10 or 12. And, therefore, the military gets an individual long after his basic patterns and his basic behavior has developed. And the military can do very little to change these patterns.

Mr. MARTIN. Are you talking about actual behavior patterns, or certain predispositions which may affect behavior patterns?

Dr. TENNANT. I am talking about both. We know that drug taking starts at a very young age, and that people who become very severely drug dependent in adult life, as a general rule start their drug taking at age 8, 9, 10, or 12.

Mr. MARTIN. And you also made the point in your testimony that in Italy, where they clamp down hard on drug pushers and drug abusers with very heavy penalties for being caught in the possession of hashish, that there are no serious problems with American service-

men. So the question of availability appears to exercise a considerable influence, even where you may have a widespread predisposition to get involved in drugs?

Dr. TENNANT. That is not a contradiction to my other statement. And that certainly is true. We know that basic behavior patterns are formed at a young age, and you basically, frankly, have to have some laws and controls to make sure that behavior does not become destructive for society and to the individual later on. And I think the Italian laws are a dramatic example. We do not have hashish abuse in Italy among our soldiers. The number of European urine tests that are positive there in our urine screening program is very, very small, because they have very stiff penalties. However, in West Germany, of course, they are very lax. And it is ignored by the German Government, so, therefore, it is severely abused. And maybe you cannot legislate morality, but drug taking is not exactly morality. It can be reduced by control.

Mr. MARTIN. You can legislate the scale of drug abuse, or at least within certain degrees you can reduce it by having laws that are toughly enforced, or you can increase the scale of drug abuse in the same population by having lax laws that are weakly enforced?

Dr. TENNANT. That is very true.

Mr. TARABOCHIA. Dr. Tennant, do you think that the attitude of the local population in Italy and Germany affects the abuse of hashish and marihuana? Because I know that the Italians, for instance, looked down on the drunkards, they consider it disgraceful, and they do not have anything to do with a person who abuses alcohol, despite the fact that the Italians produce some of the best wine. Do you find any relation to that?

Dr. TENNANT. I cannot give you any scientific data, but my own opinion is that, yes, it does make a difference.

Mr. TARABOCHIA. I see. Thank you.

Mr. MARTIN. Dr. Jones also made the point that the rate of drug abuse among our economically deprived strata, especially the urban strata, is much higher than the rate of drug abuse for the population as a whole, perhaps by a ratio of two to one. From your own knowledge of the problem in this country, would you concur with this estimate?

Dr. TENNANT. Again, generally speaking, this has been very true in the past. However, in the last 5 years it has become less true, since we have seen severe heroin addiction in the upper strata of society and even in rural areas. But generally speaking you still, I think, probably do see more severe drug abuse in your lower socioeconomic groups.

Mr. MARTIN. And accepting this, would it be reasonable to anticipate that the shift to a volunteer Army, at least initially, might increase the problem of drug abuse, because the armed services would be getting more people who are involved as drug abusers at the point of admission—unless, of course, energetic measures were taken from the outset to cope with the problem of occasional drug users who might become very heavy drug users if something were not done to discourage them?

Dr. TENNANT. My first inclination is that with the all-volunteer force, drug abuse will go up. But again, there are some factors that I do not know about. And that would be, for example, have our recruiting stations and have our induction people gotten more skilled at detecting drug dependent people at the time of induction? And so you see, we could actually, just based on the competency of the induction center to screen out people, have less drug abuse in the Armed Forces now than we did, say, 3 years ago. I do not know, however, whether this is the case.

Mr. MARTIN. There is a problem, Dr. Tennant, of the pressure to fill the volunteer quota, because volunteers have not always been easy to come by.

Dr. TENNANT. I have heard that, sir.

Mr. MARTIN. I have only asked one question about why the armed services, in your opinion, have had some success in coping with the cannabis epidemic, whereas in the United States all of the evidence presented to the subcommittee so far indicates that the epidemic is growing at an incredible rate, and it has now spread through all strata of the population. Conservative businessmen are taking it, and high school juniors are taking it, and grade school children are taking it, blue collar workers are taking it, everyone is using it. Are there any other reasons you can think of that it would help to explain the contrast between the relative success that the armed services have had—the partial success—and the apparent lack of success, the total lack of success, here on the homefront?

Dr. TENNANT. The only place in the Armed Forces, of course, that I can speak of with much knowledge is U.S. Army, Europe. And if indeed we have had some success there—and I emphasize that I would need to see some recent epidemiological surveys to know if we have—but let us say that we have. If indeed we have, I would have to at least partially attribute that to the efforts that have been made there by the command. I think the one overriding thing that has been apparent there, particularly since General Davison took command—and I do not mean to give accolades to my old commander, but I think he has done a very fine job. And I think our success has been due largely to attitude. And that has been reflected, I know, from DOD level down, that we are not going to take a neutral or advocacy position regarding drug use within the military services.

Mr. MARTIN. In short, it has been a command decision that this is a bad thing, and we have got to do something about it, and there has been an effort, involving an educational program, involving a beefed up law enforcement program, and a treatment and hospitalization program?

Dr. TENNANT. Absolutely. In 1969 my commanding general was Major General Tabor. And even as far back as then our entire division took the attitude that we would approach the problem on two fronts: We would step up law enforcement efforts and prevention efforts, and we would also start developing treatment programs, and education programs. And, of course, we do not know what would work, but we would try. And I think that attitude has persisted. I think that in the military forces—at least in the U.S.

Army, Europe, and throughout the rest of the Army—this has been a prevailing attitude.

Mr. MARTIN. And you do not feel that we have a comparable overall effort on the homefront in the United States—that is, an effort which would combine the energies and the devices open to government and the energies of the press and the academic communities, in short, an across-the-board united front?

Dr. TENNANT. Again, I do not have any scientific evidence. But it makes very good commonsense that if you are going to have academic institutions, advocating drug use; Federal agencies giving grants to agencies that advocate the use of marihuana and other drugs; and a press that is actively calling for legalization of marihuana and the use of other drugs; I do not see how with this type of neutral or advocacy stand that we can have reduced drug consumption. It makes just good commonsense to me.

Mr. MARTIN. I think that completes my questions, Dr. Tennant. I want to thank you very much for your patience. And we will go on to our next witness, Mr. Cooke.

I am sorry we kept you waiting so long. You have already been sworn. So we will proceed with your statement. And then I have some questions I would like to ask.

TESTIMONY OF DAVID O. COOKE, DEPUTY ASSISTANT SECRETARY OF DEFENSE, OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE (COMPTROLLER), ACCOMPANIED BY DR. JOHN F. MAZZUCHI (PHD), ASSISTANT FOR EDUCATION AND INFORMATION, DRUG AND ALCOHOL ABUSE, ASSISTANT SECRETARY OF DEFENSE (HEALTH AND ENVIRONMENT); BRIG. GEN. W. A. TEMPLE, USAF, COMMANDER, OFFICE OF SPECIAL INVESTIGATIONS, U.S. AIR FORCE; COL. FRANK W. ZIMMERMAN, USAF (MC) OFFICE OF THE SURGEON GENERAL, USAF; DAVID N. PLANTON, HEAD, CRIMINAL DIVISION, NAVAL INVESTIGATIVE SERVICE; COMDR. S. J. KREIDER (MC) USN, PSYCHIATRY DIVISION, BUREAU OF MEDICINE AND SURGERY; COL. HENRY H. TUFTS, U.S.A., COMMANDER, U.S. ARMY CRIMINAL INVESTIGATION COMMAND; COL. WAYNE B. SARGENT, U.S.A., CHIEF, ALCOHOL AND DRUG POLICY DIVISION, OFFICE OF THE DEPUTY CHIEF OF STAFF, PERSONNEL, U.S.A.; AND COL. JOHN J. CASTELLOT, U.S.A. (MC) CHIEF, DRUG AND ALCOHOL, OFFICE OF THE SURGEON GENERAL, U.S.A.

Mr. COOKE. May I get the rest of the members of my team up here so that it will be a little easier?

Mr. Chairman, I am pleased to be here today to present information on investigative and other efforts of the Department of Defense pertaining to the control and ultimate elimination of the use of dangerous drugs, including cannabis, by military personnel.

Maj. Gen. Frank B. Clay, Deputy Assistant Secretary of Defense for Drug and Alcohol Abuse, supported by other witnesses, has previously appeared before this committee and provided information

on his responsibility. If you will recall, his testimony concerned the prevention of drug abuse in the armed services through education programs, the identification of service members who abuse dangerous drugs and alcohol and the short-term rehabilitation efforts of those military drug abusers who cooperate with their own treatment. Accordingly, my statement will be concerned with the investigative and security aspects.

Accompanying me today are representatives of the three military department investigative organizations, a medical officer from each of the military departments and a representative from the Office of the Assistant Secretary of Defense for Health and Environment. These gentlemen are the experts in their specific areas and are available to answer any questions you may have upon the conclusion of my statement.

The use of so-called mind-expanding drugs, including marihuana and hashish, has been and continues to be a major concern to the Department of Defense. This is not only because of the sensitive and exacting nature of military duties, but also because the use of these drugs impacts upon the morale, discipline, and security required for a well-trained and efficient Military Force.

Prior to the mid-1950's, the Armed Forces experienced little criminal activity associated with the sale and use of marihuana and narcotic substances or the illegal use and abuse of prescription-type drugs. We have reason to believe that when the "drug culture" surfaced within American society, subcultures also surfaced within the Military Services.

The buildup of American Forces in South Vietnam during the mid-1960's resulted in an upsurge in the use of opiates, principally heroin, and marihuana. Inasmuch as the conflict waging in Southeast Asia was of vital national concern and heroin was so readily available to our Military Forces, our main thrust in combatting drug abuse was focused in this area and was almost totally concentrated on the elimination of hard drug usage by our military personnel stationed there.

One such thrust was the use of our customs program. New policies, procedures, and processes were developed to eradicate Military channels as a means for the distribution of narcotics and drugs both to our troops in Southeast Asia and worldwide.

Historically, the U.S. Customs Service has depended upon the efficiency and integrity of the military departments to perform customs inspection of Department of Defense personnel, mail, cargo, and household goods in overseas areas.

In April 1971, representatives of the House Committee on Foreign Affairs visited Southeast Asia to review the drug problem in that area of the world. As a result of this visit, the Commissioner of Customs initiated an intensified customs inspection program to reduce the entry of drugs and other contraband items into the United States. In May 1971, instructions were issued to all regional customs commissioners to immediately implement a 100-percent inspection of all Department of Defense personnel, their personal property, mail, Department of Defense-sponsored cargo, ships, and aircraft—including crews—arriving in the continental United States and Hawaii from Vietnam and Thailand.

These expanded procedures initially created problems and delays in processing passengers and the movement of cargo and mail. Previously, customs inspection performed by military customs representatives at the point of origin were acceptable to U.S. customs officials, with U.S. customs representatives performing only spot checks in the continental United States. The military services were concerned about the impact and magnitude of the problems that would result once the 100-percent inspection of personal property shipments became fully operational.

To assist the U.S. Customs Service and to reduce the delay in the movement of passengers, baggage, and cargo at ports of entry in the United States, 92 personnel were provided by the DOD to assist U.S. Customs Service. In addition, the Air Force provided 15 ground security personnel to assist U.S. Customs personnel at air terminals in the United States and Alaska.

As a result of this 100-percent inspection, seizure or "hit" statistics compiled by the U.S. Customs Service showed that their suspicion that military channels were being used to smuggle large quantities of narcotics and other contraband materials into the United States were unfounded. Subsequently, the 100-percent requirement was lifted and the 92 DOD personnel augmentation was withdrawn.

On June 9, 1971, the Department of Defense announced support of the intensified customs inspection program. The Army, in coordination with the Navy and Air Force, was directed to prepare a coordinated action plan. Subsequently, the Army was designated the executive agent, under my supervision, for customs matters in the Department of Defense.

Concurrently with this intensification of customs inspection the Department of Defense implemented an aggressive program to reduce and ultimately eliminate the use of military channels as a means of transporting illegal narcotics, contraband, and other controlled substances into the United States. The U.S. Customs Service has assisted the Department of Defense in this effort by providing training to designated military customs inspectors, and by on-site monitoring in order to evaluate and improve the operations.

To properly coordinate the program with other appropriate Federal departments and agencies, and to monitor the DOD-wide operation, the following assignments of responsibility have been established: Deputy Assistant Secretary of Defense, Administration, is the single DOD point of contact for customs inspection matters and exercises staff supervision over all customs inspection matters within DOD; Department of the Army is assigned executive agent responsibility for customs inspection activities in DOD; Secretaries of the military departments are responsible for implementation of programs within their respective services; area CINC's are responsible for programs within their respective commands.

Subsequent to the assignment of responsibilities, a long-range planning program was developed, in conjunction with the U.S. Customs Service, by the Department of Defense. This program covers all aspects of customs inspections for personnel, baggage, mail, and cargo processing through DOD transportation channels.

The objective of the program was to establish a DOD customs inspection program which was acceptable to the U.S. Customs Service and eliminated need for reinspections by the U.S. Customs Service, except for integrity checks.

A DOD directive and regulation were published and have been distributed to DOD activities worldwide. These publications, along with implementing publications issued by the respective area CINC's, establish detailed procedures for conducting all types of customs inspections. They also establish program responsibility at all organizational levels and provide a working document which can be used for determining training needs and requirements.

The Pacific Command had several on-going programs to suppress drug abuse and drug trafficking prior to the intensified program in 1971. With the inception of the DOD customs program, the Pacific Command was in a position to implement various aspects of the program immediately to prevent the flow of narcotics, drugs, and other contraband within the command and into the United States.

Vietnam had the greatest troop concentration and since drugs and narcotics were easily obtainable, troops stationed there were particularly vulnerable to drug trafficking. In view of this, most of the early efforts in the PACOM area to eliminate drug use and shipment to the United States were directed toward Vietnam. To supplement DOD efforts, the U.S. Customs Service was requested to provide training assistance. The U.S. Customs Service responded by sending personnel to PACOM to provide training in customs inspection techniques to DOD military personnel. As a result of this training, a Joint Military Customs Group was formed in Vietnam and this group eventually reached a peak of 450 assigned personnel. The group performed predeparture inspections and examination of all personnel, personal property, mail, and some military cargo departing Vietnam for the United States.

The effectiveness of the Joint Customs Group was reflected in statistical seizure reports which showed an overall reduction in contraband and narcotic seizures made from personnel, accompanied baggage and mail, exiting Vietnam. Since the Joint Customs Group proved to be quite successful, it was decided to apply this concept to other countries in the Pacific area. Although no additional formal groups were formed, military country commanders in other Southeast Asian countries organized their efforts along the joint-group concept.

As the DOD customs inspection program was implemented throughout the PACOM area, U.S. Customs officials provided appropriate training to designated military customs inspectors in Thailand, Japan, Korea, Philippines, and Okinawa. With the drawdown of military forces in Vietnam, the need for the Joint Customs Group was accordingly reduced. It was subsequently dissolved as a formal unit and the functions were assumed by area commanders utilizing those personnel trained by the Customs personnel, or who had received on-the-job training from qualified personnel.

In November 1971, a test project to inspect all mail not previously inspected by the Joint Customs Group or military postal personnel was instituted at San Francisco by the U.S. Customs Service. It was

the opinion of the U.S. Customs officials that this channel provided an excellent means for smuggling contraband into the United States. The U.S. Customs Service requested DOD to provide 25 military personnel to work directly under U.S. Customs supervision at the San Francisco and Oakland mail terminals. These individuals were to assist customs inspectors in the physical examination of all military mail from the Pacific Command. DOD assigned 25 personnel in early December 1971. During the period from December 1971 to November 1972, 460,000 parcels were examined, and these examinations resulted in only 14 narcotic seizures. In December 1972, the DOD discontinued this support and the personnel were released for other assignment.

The rapid turnover of military custom inspection personnel within the Pacific Command has resulted in a continuous need for training of replacement personnel. To alleviate this problem, the U.S. Customs Service has provided agents who are now serving in the Pacific Command as advisers and trainers to the area commanders. As a result of the training and assistance given by the U.S. Customs Service, an effective inspection program has been developed. Presently, the predeparture inspection by military inspectors in most countries within the PACOM area is again accepted by U.S. Customs with only a spot check of a few items made on arrival in the United States.

The DOD implementation of the customs program in Europe follows much of the pattern of implementation of the program in the Pacific Command. CINCEUR has devoted most of his efforts to developing an operational program for Germany due to the large troop concentrations in that country. There is an established military police organization that has been assigned responsibility for the customs inspection of all DOD passengers, their accompanying baggage, and other personal property shipments prior to the departure from Germany for the United States. Inspection requirements in other European countries are accomplished by military customs inspectors assigned on an area basis and by postal personnel for military mail.

DOD and the U.S. Customs Service are jointly cooperating in training of military customs inspectors and are currently coordinating a phase of the predeparture inspection program at Rhein Main Air Base, Germany. This has resulted in modification of the physical arrangements of the air terminal and changes to agreements with commercial contract air carriers.

The military inspectors at Rhein Main Air Base are presently being trained by U.S. Customs Service personnel on personnel and baggage inspection and examination procedures. In addition, the U.S. Customs Service personnel are observing the performance of the predeparture inspections to insure that U.S. Customs Service standards are met. It is intended that a U.S. Customs Service officer will be permanently assigned to Rhein Main to monitor DOD predeparture inspections. This should substantially reduce the need for reinspection in the United States by U.S. Customs, thereby resulting in savings for both DOD and U.S. Customs Service.

During the return of DOD units from exercises in Germany, the U.S. Customs and Department of Agriculture located officials on

site in Germany to observe the military customs inspection, and were thus able to grant predeparture clearance to the returning direct flights to the United States.

Customs inspection programs for other European countries where U.S. Forces are stationed have been developed and are operational. Narcotic seizure reports received from the U.S. Customs Service which are based on their reinspections of DOD personnel, baggage, mail, and cargo exiting Europe indicate that DOD channels are not being used to transport any significant amount of narcotics into the United States.

In the Southern Command, U.S. Army Forces, South, has responsibility for the DOD customs inspection program. Although predeparture inspections are being conducted, U.S. Customs Service personnel are performing reinspections in the United States. This is partially due to the lack of trained military inspectors and the resultant difficulty of fully complying with all DOD customs inspection procedures. The Commander of U.S. Army Forces, South, is presently evaluating program requirements prior to requesting U.S. Customs Service training assistance. Also, plans are now being developed to establish a program for predeparture clearance similar to the Rhein Main program.

On August 1, 1971, President Nixon established the Cabinet Committee on International Drug Control. In addition to the Cabinet-level committee, there are a number of subcommittees in the overall narcotics control structure. DOD is represented on all these committees and we have found the structure to be available in the coordination of Federal interdiction program efforts. The DOD has provided various forms of support to programs that have been initiated and are controlled by the Cabinet Committee. This support has been restricted to the provision of materials and equipment and some minor amount of training. We are well aware of the participation limitations placed on the DOD, particularly by the Possee Comitatus Act, which severely restricts the DOD in taking an active or operational role in any of these programs. Furthermore, all support which has been provided has been on a totally reimbursable basis.

With respect to the investigative programs of the military departments, the services have initiated programs in those areas where large troop concentrations and/or the availability of drugs and narcotics, including marihuana and hashish, are of great concern to the Department of Defense. The following examples are indicative of the programs which have been inaugurated by the services.

In addition to their worldwide drug investigative programs, the most extensive drug suppression efforts by the U.S. Army Criminal Investigation Command are being concentrated within the European Command. Over 508,000 military personnel, Army dependents, and Department of the Army civilians are located in a geographical area about the size of the State of Oregon. This large concentration of comparatively affluent Americans provides a lucrative market for the traffickers of heroin, marihuana, and hashish.

To combat this threat and to plan for future operations, the Army has developed a program which uses informants as well as

investigative personnel. The Army's program in Europe is divided into three operational levels.

Level 1 is the identification of international traffickers who bring narcotics and dangerous drugs into Germany for consumption by U.S. Forces personnel and to provide information to the host country law enforcement agency concerning those indigenous personnel engaged in wholesale trafficking. Results to date have been highly satisfactory.

Level 2 are investigations designed to develop and report narcotic and dangerous drug trafficking and use directed toward U.S. military personnel in close proximity of military installations.

Level 3 are investigations in the immediate geographical area to directly support a commander. In addition to investigating reported drug cases, investigators at this level of operation provide briefings and presentations to unit commanders and civic organizations concerning the identification and effects of drug abuse.

A specialized activity utilized within USAREUR is the U.S. Army, Europe, Drug Information Center. Its mission is to collect, analyze, coordinate, and disseminate information from all levels of operation and from all participating activities which relates to drug trafficking, smuggling routes, modus operandi, and geographical areas experiencing high drug incident rates.

There is an additional coordinated effort being exerted in the Federal Republic of Germany to combat the GI drug pushers. This program has as its objective the isolation and elimination of the GI pusher and to reduce the pusher's mobility and access to drugs.

The Naval Investigative Service responds to all requests for investigation of drug abuse where it has jurisdiction. In addition to conducting these investigations, NIS has instituted criminal intelligence operations to develop narcotics information.

In December 1972, a narcotics intelligence operation was commenced at Subic Bay in the Philippines. This operation was designed to identify those individuals in the Philippine community who were engaged in trafficking drugs to naval personnel. As drug pushers were identified, operations were mounted to effect their arrest by Philippine authorities. This operation has been highly successful and, at the present time, marihuana is scarce and hard drugs are virtually unobtainable in the area of the Subic Bay Naval Base.

In early 1973, NIS began to conduct antinarcotics operations in various ports visited by 7th Fleet ships, such as Hong Kong, Singapore, Bangkok, Manila, and Penang, Malaysia. These operations were aimed at street-level pushers who were targeting visiting 7th Fleet sailors. Working with host government authorities, NIS team members effected the arrest of many pushers. These arrests reduced the availability of illegal drugs and drove up the price, making the drugs less attractive to fleet personnel.

As a result of the Navy operations, a total of 1,197 individuals have been apprehended.

NIS intends to maintain pressure on drug traffickers throughout southern Asia by continuing the antinarcotics operations cited above. In addition, operations of a more limited scope are being initiated on the Island of Guam and in the port of Naples, Italy.

To combat the use of hallucinogenic drugs such as marihuana and hashish, the Air Force instituted several new investigative concepts. The most effective of these is the Drug Abuse Development File. This concept groups all suspected drug traffickers on a given Air Force installation in one investigative file until such time as a viable case is developed on a specific individual in the file. At this time a separate case is initiated. This concept has enabled the Air Force investigative office to more effectively collate all known information on suspected drug traffickers, minimizing the cost in terms of money and manpower of pursuing these drug traffickers.

Another effective program is the awards program wherein known drug offenders are offered a monetary inducement to furnish information on drug traffickers. Since its inception, this program has identified numerous military drug users and has resulted in the removal of large quantities of illicit drugs from the market.

Other techniques have involved the use of controlled buys of drugs using technical aids, undercover agents, and marihuana "sniffer" dogs.

The foregoing examples for the three Military Department investigative organizations are only a small part of their overall investigative efforts devoted to the drug and narcotic program. As stated previously, close attention is being paid to the drug abuse situation, worldwide, and as problem areas are identified, appropriate action will be directed to eliminate the problem.

Until such time as drug abuse in the Armed Services poses no threat to the morale and discipline of a well-trained and effective Military Force, the Department of Defense will remain dedicated to the mission of total eradication of all illicit drugs and narcotics, including marihuana and hashish.

This completes the formal portion of my presentation. I am ready to answer any questions with respect to the Department's customs or investigative programs that you may have.

Mr. Martin. There were a few questions I intended to ask at the beginning of your testimony, Mr. Cooke, for the purpose of establishing your credentials. And I am going to condense the list of questions, in the interest of economy of time.

You have been involved, I believe, in various positions in defense management since 1958 when you were a member of Secretary of Defense McElroy's task force on reorganization, which led to the DOD Reorganization Act of 1959?

Mr. Cooke. That is correct.

Mr. Martin. In 1959 you developed a policy reference book for Secretary of Defense Gates?

Mr. Cooke. Yes.

Mr. Martin. In January 1961 you were assigned to the Office of Organizational and Management Planning established by Secretary McNamara?

Mr. Cooke. Yes, sir.

Mr. Martin. In 1964 you assumed the position of Director of the Office of Organizational and Management Planning?

Mr. Cooke. Correct.

Mr. Martin. In January 1969 you became Deputy Assistant Secretary of Defense for Administration?

Mr. Cooke. Correct.

Mr. MARTIN. And you are now serving as Deputy Assistant Secretary of Defense for Administration in the Office of the Assistant Secretary of Defense, Comptroller?

Mr. COOKE. Correct.

Mr. MARTIN. Thank you, Mr. Cooke.

I perhaps should have started out by establishing the fact that you served in the U.S. Navy, and that you retired with the rank of Captain.

Mr. COOKE. I am proud of that fact, sir.

Mr. MARTIN. In the case of your supporting witnesses, if it is acceptable to you and to them, Mr. Cooke, I would like to suggest that—again in the interest of the economy of time—we simply insert into the record the biographical notes that you have given us.

Mr. COOKE. I have been assured by my associates that that is entirely acceptable.

[The biographical notes referred to may be found in the Appendix, p. 425.]

Mr. MARTIN. Thank you.

Then we can proceed with the questions.

My first question has to do with the scale of the problem of cannabis abuse, especially as it affects our servicemen in Europe. I believe that some of the DOD witnesses here have had an opportunity to examine the testimony already taken by the Senate Internal Security Subcommittee. This testimony established that over the past 5 years there has been a 10-fold increase in the quantity of marihuana seized by Federal agents, to a figure of 780,000 pounds in 1973, while hashish seizures over the same period of time have increased 25-fold to a figure of 53,300 pounds. Allowing for substantial seizures at local levels, and assuming that roughly 9 or 10 times as much gets in as they succeed in seizing, we come up with truly astronomical figures for the consumption of marihuana and hashish in the United States. This has been the subject of previous testimony. We know that our Armed Forces are recruited from our population at large—that if we have an epidemic of this magnitude affecting our general population, it is also bound to affect our armed services. And the problem, of course, has particular significance from a security standpoint when it affects servicemen on whom the ultimate security of our Nation may rest.

First, I would like to try to resolve some apparent conflicts in the figures we have received from General Clay on May 9th on the frequency of cannabis use in the armed services, and some further conflicts, or apparent conflicts, between his figures and those we received from Dr. Tennant today.

According to table No. 2 [see page 44], which was appended to General Clay's testimony, a worldwide sample survey of marihuana use among Army enlisted grades taken in February 1974 reported that 69.4 percent of the personnel responding claimed that they had never used marihuana, apparently even experimentally. This is an extraordinarily high figure, in my opinion, considering the fact that our armed services are made up for the most part of young men belonging to the most cannabis prone age, and also considering

the fact that a very high percentage of our voluntary forces come from economically deprived groups where the percentage of cannabis use is somewhat higher than it is for the population as a whole. On the other hand, according to table No. 1 [see page 44] attached to General Clay's testimony, a commandwide sample survey of cannabis use by U.S. Army, Europe, also taken in the same month, February 1974, found 46 percent of the respondents admitting to having tried cannabis at least once, as against just a shade over 30 percent who admitted to having tried it on the worldwide survey.

General Clay indicated some personal reservations about these surveys because they were based on voluntary responses. I wonder if any of our witnesses here could throw any light on the discrepancy—it is a rather marked discrepancy—between the percentage for Army enlisted grades worldwide and the percentage for U.S. Army personnel in Europe who admitted to having had any experience with cannabis in reply to questionnaires apparently circulated in the month of February 1974?

Mr. Cooke. Of course, obviously one question there was confined to the Europe theater, and the second was worldwide. There may be other factors involved in the discrepancy.

I have with me Colonel Sargent, who is the Chief of the Alcohol and Drug Policy Division in the Office of the Deputy Chief of Staff, Personnel, U.S.A.

Colonel Sargent, would you care to comment further on the apparent discrepancy in the two surveys?

Colonel Sargent. Yes, I will, sir.

In the survey conducted in Germany, U.S. Army, Europe, asked the soldiers had they ever used cannabis—which of course could extend to use prior to entry into the service.

In the survey that the Army distributed worldwide in February 1974, we wanted to confine our question to a specific period of time. We believe this provides better data and provides less ambiguity in the matching of data received now and future surveys. Our question addressed specifically the 6 months prior to February. We did this in the representative sampling of all grades. But, of course, for the enlisted grade E–1, we got responses based in part on a time period prior to entry to service. We were interested in the 2- to 3-month period prior to entry into the service. That is the basic difference.

With reference to the disparity in Europe, the command breakout subsequently—and we have not yet completed all of the refining of the survey data—the USAREUR Command figures also correspond to the worldwide data. We believe that the survey technique is a valuable tool by which we can corroborate other report statistics that we get within our program. I believe Dr. Tennant's testimony indicated that there has been some measure of improvement based on his own survey techniques, and these recent data tend to support the downward trends, although slight.

Mr. Martin. Dr. Tennant also indicates some serious reservation about the efficacy of questionnaire surveys conducted by mail. Do you know whether either of those surveys was conducted by mail?

Colonel Sargent. Either of our surveys?

Mr. MARTIN. Yes, either the worldwide survey or——

Colonel SARGENT. No, they are not conducted by mail. They are anonymous submissions, but in a controlled environment.

Mr. MARTIN. So that they assemble the soldiers, and they get them to fill out the questionnaires, and they fold them up and have to drop them in the boxes, as they leave the room?

Colonel SARGENT. With complete anonymity, no social security account number.

Mr. MARTIN. But you get everybody in the room, there are no escapees?

Colonel SARGENT. Yes, sir. There will be a representative group selected by random sampling. These individuals are then directed to assemble and are administered the test in a controlled environment.

Mr. MARTIN. I come back to the point: once they enter the controlled environment there are no escapees?

Colonel SARGENT. That is correct, there are no escapees.

Mr. MARTIN. They must drop the questionnaire in the box before they leave?

Colonel SARGENT. Yes. They have to put a response in the box. Whether or not we have obtained anything of value can only be determined later.

Mr. MARTIN. You indicated that there is a difference in the wording between one questionnaire and the other questionnaire. This obviously leads to some differences in the results obtained. Would there not be an advantage to using a uniform questionnaire throughout the armed services and on a year after year basis? After all, if you change the wording in a questionnaire, you might get a significantly different reading which will make it impossible to compare the results for 1974 with the results for 1973 or 1972 when you used questionnaires that were differently worded.

Colonel SARGENT. The single difference here is that one command, USAREUR, administered their own survey, designed to respond to their own requirements. The worldwide survey is one we developed to be used semiannually, and the questions will be used repetitively; the same questions will be included in the August survey. From this we hope to develop trend data.

Mr. MARTIN. Thank you for that information.

Dr. Tennant, in his testimony made the point that in different surveys he had found a range of responses that went from 48 percent—this applies to servicemen who admitted to having used cannabis one or more times—the range was 48 percent, and 35 percent, and 35 percent came toward the end of 1971. And for this reason he felt that there has been a certain improvement, at least during his period of service, in West Germany. Does that coincide with your own impression, Colonel Sargent?

Colonel SARGENT. I think there has been improvement. I want to get a repetitive survey, administered by the Department of the Army worldwide; then we can better assess the trends.

Mr. MARTIN. If table No. 1 in General Clay's presentation can be believed, the U.S. Army in Europe has in effect succeeded in reducing the percentage of daily cannabis users from 10 to 15 per-

cent prior to 1973 to 7 percent in 1974. If that is accurate, these results do demonstrate a quite extraordinary degree of success in your drug education and control program. And this would be all the more remarkable in view of the fact that we have shifted over to a volunteer basis.

Mr. Cooke. Let me make the point, Mr. Martin, that under the leadership of then Secretary of Defense Laird we adopted worldwide intensive program of a whole panoply of measures toward drug control, drug education and rehabilitation, that I believe were touched on by General Clay. And we think the results of these measures—and I am not confining my remarks to cannabis solely—have proved successful. I do not mean to imply that we are satisfied, but we are glad that we are headed in the right direction. And we certainly intend to continue these efforts.

Mr. Martin. We are dealing here with a rather complex situation. When it comes to heroin, for example, the antiheroin campaign conducted by our Armed Forces was conducted within the framework of a national antiheroin campaign that involved the total mobilization of all the Government resources and all available support from the media. And the academic community also pitched in, and everybody was working on it. And there has been a significant reduction, according to all accounts, of heroin abuse on the home front. One would expect this to be reflected in the armed services, even without the intensive campaign that they themselves have been conducting. I think that, in percentage terms, the armed services have made more progress than we have made in the home front.

When it comes to cannabis, however, we have not been making any progress in the home front, according to all of the evidence provided to the subcommittee. We have been losing ground badly on a year-by-year basis. And this, of course, is bound to complicate the problem for the armed services, because you are going to get far more young people who have already used marihuana to some extent before joining up.

It is a tough problem—wouldn't you agree with that?

Mr. Cooke. I think it is. Because certainly the demographic slice of the youth of America we take in our Armed Forces reflects the attitude and habits of the general young Americans of their age. I would suggest, though, that perhaps we have exerted more efforts in the area of cannabis than has been done on the home front.

Mr. Martin. I think there is very little doubt about that.

The subcommittee has heard, not only from Dr. Tennant but from other sources, that there have been quite a number of cases in which vehicles also have been wrecked by drivers under the influence of hashish, and expensive equipment have been damaged or destroyed. And we have heard of one instance in which a B–52 bomber took off with an air crew stoned on hash. And I would like to ask General Temple and Mr. Planton—and there may be someone I have omitted here—whether they have personal knowledge of such incidents, and if they do, whether they could provide some details for the record, simply for the purpose of establishing that this is a real problem.

Mr. Cooke. May I introduce for the record General Temple, who is the head of the Office of Special Investigations in the Air Force on my immediate right; and Colonel Tufts, who is the commander of the U.S. Army Criminal Investigative Command; and on his right Mr. David Planton, who is head of the Criminal Division of the Navy Investigative Services. These are our top investigative people. And if you would like us to respond very briefly, we will amplify, if we may, for the record.

General Temple.

General Temple. Very briefly, sir, as you may be aware, we were aware of the subcommittee's concerns in this area. With reference, for example, to the story of the B–52 crew stoned, my organization has the files on all of the marihuana and other narcotic investigations that were conducted in the Air Force, and we made a special effort to research our files thoroughly to attempt to confirm any such case. We were unable to confirm any such happening.

Mr. Cooke. Colonel Tufts.

Colonel Tufts. Again, not in the aircraft, but in the vehicle area, we have isolated cases where we have had traffic accidents. And we have had individuals involved in accidents where there was an indication that they might have been using marihuana or hashish. And we have had accidents where, when the vehicle was found, or when the police came on the scene, they were in the process of transporting, and there was no evidence that the transporter was a user. I think I could sum it up in general by saying, we might have a number of cases, I would not say they are isolated, but we do not have a trend, we do not have a pattern, and we do not identify this as a major problem, i.e., getting involved with the usage, and then a resultant accident from the usage.

Mr. Martin. You have had quite a number of cases involving drunken drivers?

Colonel Tufts. Yes, sir.

Mr. Martin. You have heard Dr. Tennant's testimony that in many cases the drivers who appear to be drunken drivers, or those who appeared to be drunk on alcohol, are not really drunk on alcohol alone, but drunk on alcohol and hash—that is, they may have had one drink of alcohol, and then smoked a pipe of hash. And the hash has affected them a lot more than the alcohol—the two things work together synergistically, they compound the effect, or potentiate effect. And when the driver has his accident, you can smell the alcohol on his breath, you cannot smell the hashish—and it is put down to drunken driving, it is put down to alcohol, when in fact it may be a combination of the two.

Now, as Dr. Tennant pointed out, we have got to do a lot of research. We have no way of establishing either in the civilian sector or in the military sector whether drivers involved in accidents who appear to be drunk on alcohol are in fact drunk on a combination of alcohol and cannabis.

That is a question to which you cannot have any answer.

Colonel Tufts. In my area we investigate only when a fatality is involved. The local police, or the military police, would pick up such an individual without a fatality, and they would investigate.

And then, of course, you would get on the medical side of the house, where you would have a blood alcohol test and—maybe Dr. Tennant can answer better than I—possibly urinalyses tests. I would not be personally intimately familiar with this procedure. But I think I would have heard about it if there were a problem.

Therefore, I do not think I can address it with any certainty saying that it is a problem. I do not think it is.

Mr. COOKE. Mr. Martin, as a retired Navy captain, I would hate to ignore Mr. Planton of the Navy.

Mr. PLANTON. Yes, sir.

First, the Naval Investigative Service, like the Army, does not investigate traffic accidents per se, unless there is a fatality or some unusual circumstance. We would have no record of instances where the cannabis use has been directly related, or that we became involved in the investigation of a traffic accident or a fatality, because of marihuana use.

Going to the damage incidents on ships, we have had some cases where there is a possibility that the use of cannabis or marihuana was a contributing factor. However, it is very difficult to say that precisely.

As an example, we had a mattress fire in the barracks of a Navy hospital. We developed no suspects in the case, but at the scene, we found marihuana residue. It was rumored among the troops that it had been used there. I cite this as an example, that while marihuana may have been a contributing factor, it does not necessarily follow that marihuana use was going on at the time that the fire started.

Mr. COOKE. I think we would be concerned about this obviously in the same way that we often read in the paper that somebody has had a few drinks and then the mattress caught on fire, because the effects of intoxication are apparently somewhat similar.

Mr. MARTIN. This is a problem that is probably much better in the civilian sector than it is in the military sector, but all the scientists who testified before our committee were agreed that the problem of cannabis intoxication and driving is becoming one of increasing magnitude, and no answer has yet been found to it. There have been many drunken driving accidents which have been put down as alcoholic drunken driving accidents that were in fact due to alcohol plus cannabis.

Mr. COOKE. I think that is a fair statement, and undoubtedly true. It is true for our drivers in the military driving their cars on liberty as for anyone else in the community.

Mr. MARTIN. Do the officers who are with you, Mr. Cooke, have any knowledge of any instances where secret or top secret security clearances or nuclear clearances have had to be withdrawn because of cannabis abuse? Dr. Tennant said that he had knowledge of a half dozen such cases.

Mr. PLANTON. For the Navy, negative.

Colonel TUFTS. The Army is negative, as far as I know.

Mr. MARTIN. What about the Navy?

Mr. PLANTON. The Navy is negative.

General TEMPLE. Your question was whether the clearances were withdrawn?

Mr. MARTIN. Any clearances that had to be cancelled or withdrawn because it was subsequently discovered that the subject enlisted man or officer was involved in cannabis abuse.

Mr. PLANTON. I beg your pardon. I misunderstood your question. I thought it was a question about the disclosure or selling of secret material. I know that there have been cases in the Navy where individual ratings have been changed because of an individual's proclivity to use marihuana. I do not have the number.

Mr. MARTIN. Their clearance rating?

Mr. PLANTON. Yes. Or, for instance, if they had a radioman's rating where security clearance was a condition of that rating, the Navy has changed their rating to some nonsensitive rating.

Mr. MARTIN. Coming back to the Army, the question may not have been clear.

Colonel TUFTS. I think I misunderstand you, too.

Mr. MARTIN. Have there been any instances that you know of where security clearances, secret or top secret, or nuclear clearances, have had to be withdrawn because it subsequently came to the attention of the Army that the subject officer or enlisted man was involved in cannabis abuse?

Colonel TUFTS. This does not fall within my area. The Army's military intelligence handles that. I am sure that I can arrange to get an answer to it. I know of none myself. Again, my answer remains the same. But I will get an answer on that within a day or two and give it to Mr. Cooke.

Mr. COOKE. I would think this, that we have for security clearances a whole list of criteria, one of them being habitual use of drugs, habitual use of alcohol, among others. And I would think it highly probable—and certainly I would hope so—that in the event that the man with a clearance and a need to know in these sensitive areas and he turned up as a drug user, an alcoholic, or what have you, that clearance will be withdrawn, and he will be, if not subject to appropriate administrative or disciplinary action, certainly shifted to a nonsensitive job, where he no longer needs a clearance.

General TEMPLE. Speaking for the Air Force, and in terms of the clarified question, it is standard procedure, and we see it reflected in our narcotics investigation case files, that if substantial allegations of narcotics use, including marihuana or hash, are made sufficient to warrant our opening an investigation, it is rather standard procedure to at least temporarily disqualify the subject of that investigation from access to his clearance categories and from, in appropriate cases, nuclear clearances, pending the outcome of the investigation. If that investigation does in fact lead to a conclusion that he is a user, the normal procedure would be a permanent suspension of sensitive clearances.

If I might add a bit, in terms of the question which may have been the misunderstanding of the initial question, since my agency, the Air Force, at least does fill the counterintelligence role, I can say categorically that none of the cases we have conducted have shown that addiction, or the play on a man's habits, so to speak, by agents of a hostile foreign power has been, a factor in any of the

espionage-type cases that we have investigated. Potentially it could, but in fact we have had no such cases.

Mr. MARTIN. Theoretically it is recognized that a man who is addicted to drugs and who needs, let us say, $300 or $400 or $500 or $600 a month to finance his habit, is a security risk and could conceivably be exploited by hostile agents?

General TEMPLE. Yes, sir.

Mr. COOKE. I think it is more than potential, because General Temple indicated that we will withdraw his clearance at least temporarily.

Mr. MARTIN. Because he is a risk, at least temporarily?

Mr. COOKE. Yes, sir. But in any of the actual cases he has investigated, that has not turned out to be the causal factor.

Mr. MARTIN. The subcommittee took testimony from a number of distinguished psychiatrists in the United States and from several other countries. And they were pretty well agreed on the point that cannabis has a devastating effect on a man's judgment, and among other things, it deprives him of his own will, and makes him highly suggestible and subject to, or open to, manipulation.

Now, I would like to give you a few examples of their testimony. Dr. Harvey Powelson, who was for many years psychiatric director of the Student Health Service at Berkeley, told us:

> Such people . . . have become will-less—what we call anomic. An irony here is that they have now achieved the freedom they sought. They need an external director. They are ripe for a demogogue.

And Dr. Andrew Malcolm, a distinguished Canadian psychiatrist, similarly, told the subcommittee that there is much research to be done "to determine the relationship between marihuana and the vulnerability of the intoxicated person to persuasion." He said that the "altered state of consciousness" resulting from marihuana intoxication includes:

> An impairment of the ability to test external reality and a tendency to engage in nonlogical thinking. Marked changes in time sense and of body image occur. Emotional responses are altered and sensory perception is typically distorted. The result of these myriad effects is the creation of a person who is fundamentally changed from what he is like in a state of normal waking consciousness. His critical judgment is impaired and his capacity to effect transactions with reality is markedly reduced. As a result we may say with some certainty that such a person would be poorly defended against the influences flowing toward him. . . . It is my opinion that, among the many unusual characteristics of marihuana, one of the most important is that its users may be rendered suggestible and that what they consider to be their voluntary espousal of a new system of values may be due, in fact, to influences beyond their conscious control.

I would like to ask your psychiatric assistants, Mr. Cooke, do these observations coincide with their own?

Mr. COOKE. I would be very pleased to do that. I think I have been neglecting the medical component.

Commander Kreider, would you care to comment on that?

Commander KREIDER. I think, sir, that on the whole, the conclusions that are drawn by these distinguished psychiatrist are not in line with my personal professional experience, nor am I aware of any good controlled scientific studies which would tend to show

this, particularly with regard to suggestibility. I am not sure whether this means that the individuals who may have been more suggestible also were prone to use marihuana for its suggestibility—facilitating effects—or whether there was another explanation for it.

Mr. MARTIN. Is this not an area where it would be exceedingly difficult, if not impossible, to conduct carefully controlled studies?

Commander KREIDER. I think that two things would have to be controlled. One, particularly the use of other drugs. So many times when we think we are seeing one drug we are seeing multidrug effects. Another is that we have to be sure that the individual had never used marihuana or hashish or any other drug before. Therefore, it would take human volunteers, since I know of no animal studies in which this could be carried out. It would require controlled conditions over a period of weeks or months with volunteers, and probably a double blind study in which neither the subjects nor the scientists know which substance each individual was given.

Mr. MARTIN. A very difficult study to conduct?

Commander KREIDER. Very difficult. But if we were evaluating penicillin or any other new drug, I think we would insist on this study being carried out before we drew any scientific conclusions.

Mr. MARTIN. But when you are talking about penicillin you are talking basically about medical effects which are measurable in terms of their effect on the pulse rate and the working of the respiratory system, and so on?

Commander KREIDER. Yes, sir.

Mr. MARTIN. And this can all be done with electromagnetic devices that give you, in effect, quantitative measurement of what is happening in the body, or with quantitative measurements of the effect on the blood cells. You cannot do that with psychiatry. Actually, is it not true that most of the adverse evidence that existed until recently on the effects of cannabis consisted, in fact, of psychological observations that were made over the centuries by people in many countries where cannabis was abused? They had no hard, scientific proof that their observations were accurate. But based on their empirical experience with cannabis, they arrived at some conclusions which are now being borne out by further scientific research.

Commander KREIDER. Yes, sir, that is certainly true.

Mr. COOKE. Mr. Martin, if I may interrupt a moment, I did not want to leave the impression that in our program to deal with access to nuclear weapons and other sensitive materials there is any high incidence at all. We have rather stringent screening procedure before any individual in terms of human reliability factors is cleared for action, above and beyond the normal procedure for access to classified information. We think we do a good job of that. So I do not want to leave any impression whatsoever that this is rife, endemic or what have you. It would be a very rare occurrence.

Mr. MARTIN. Coming back to the question of the effect of cannabis—the psychological effect of cannabis—I do want to point out that this question was posed to almost every one of the distinguished psychiatrists we had before us, all of whom had had extensive clinical experience with the problem. And it was their consensus that it was there. Now, again, these may be empirical observations unsupported by hard scientific research. But I think there is enough

empirical observation here by enough men of scientific competence in their fields to warrant careful attention.

Commander KREIDER. Yes, sir, I agree that their views should be given attention.

Mr. MARTIN. We have heard among other things that in the shipboard riots that pretty well inactivated two of our aircraft carriers, I believe it was just about a year and a half ago, there was fairly widespread use of pot among the personnel involved at the time of the incidents. Do you have any information concerning that?

Mr. COOKE. I would like to ask Mr. Planton, whose organization was involved in the investigation of those, what the investigation showed.

Mr. PLANTON. The Naval Investigative Service was involved in—we have had a number of cases where there have been disputes on the capital ships including some carriers. I do not know the two that you allude to, but I presume one of them was the *Kitty Hawk*. We were there primarily to investigate the assault aspects of the matter. And during these investigations, there was no evidence that came to us that marihuana use played a key role in it, or was indeed involved. I would add too, that we have an agent on each of the carriers on a regular basis, so we have a representation there on a 24-hour-a-day basis.

Mr. MARTIN. Dr. Hardin Jones in his testimony before the subcommittee, which I believe has been made available to you prior to this hearing, informed us that when he was in Vietnam as a consultant to the Army he was told by quite a few officers that they felt that the fragging incidents were directly related to the use of cannabis. Vietnamese cannabis, as you know, is pretty potent—it has 5 percent, 6 percent THC, and that is just about the equivalent of low grade hashish. Do you have any information on that matter?

Mr. COOKE. I turn the floor over to Colonel Tufts, sir.

Colonel TUFTS. I think in your fragging incidents during the 1968, 1969, and 1970 timeframe in Vietnam that there was a relationship between the use of various drugs and the fraggings. How many I do not think we will ever know. But I think there were a number of them.

Mr. MARTIN. Dr. Jones, by the way, did indicate that he had no hard scientific evidence. It was an impression conveyed to him by quite a number of officers, an empirical impression, lacking hard scientific data to back it up. But nevertheless, it was apparently a fairly widespread impression among the officers he had consulted at the time.

Colonel TUFTS. There was a definite relationship at that time, without question.

Mr. MARTIN. And again this might suggest, might it not, that cannabis use does make people suggestible and subject to manipulation—the possibility is there, even though the proof is still lacking?

Colonel TUFTS. I cannot dispute your statement. But there were many other factors probably in that era of time that induced some of these incidents.

Mr. COOKE. Mr. Martin, I think your position essentially is that the abusers of any intoxicating agent—what we see associated with it is some absentee system, declining interest, dedication to mission,

increasing antipathy toward discipline, and degradation of traditional values. And I think this is true of alcohol and its abuse, and it is certainly true of cannabis when it is abused, or any intoxicant. So we are concerned with this problem across the board.

Mr. MARTIN. But intoxicants work on people in different ways?

Mr. COOKE. Indeed, they do.

Mr. MARTIN. And some are more benign, if you can use that term, and some less benign and more dangerous? And the evidence presented to our subcommittee over the past several weeks strongly suggests—in fact some of the scientists who testified used this expression—that cannabis is without exception the most dangerous drug on the market today in terms of the immediate and long-range damage it perpetrates on the individual user.

Mr. COOKE. Perhaps you saw that in the article in last week's U.S. News and World Report.

Mr. MARTIN. That was in our testimony. There was a lot more said in the course of these hearings.

Mr. COOKE. I know there was.

Mr. MARTIN. And we come back to the question whether cannabis does not perhaps possess certain properties that make it, in terms of the security of the Armed Forces, a considerably greater danger than alcohol abuse—it may not be abused at the same level, but nevertheless, where it is abused, it has a greater potential for damage to the individual and to the service of which he is a part.

Mr. COOKE. I think all of us here would agree with Dr. Malcolm's statement before the committee that there is much research to be done to determine the relationship between marihuana and the proneness to persuasion. And we would welcome research in that field. But it is a very difficult field for research as distinguished from empirical conclusions.

Mr. MARTIN. Mr. Cooke, you have spoken about the complex of measures designed to deal with drug traffic directed toward the U.S. military establishment in Vietnam and Southeast Asia. As you know, there we broke up a number of major traffic rings involving military personnel and expersonnel. Have there been any similar rings in the hashish traffic directed toward our military establishment in West Germany?

Mr. COOKE. May I ask Dr. Tufts, or his people, who were on the ground in West Germany, to respond first, to that question.

Colonel TUFTS. Yes, there is a concerted effort. And we have had some degree of success in exposing and in tracking the nonmilitary hashish smuggler and trafficker, particularly in the Federal Republic of Germany, but also from coming through other countries as suppliers into Germany. Our successes, I think, are good. There is still a lot of it getting through. We work——

Mr. MARTIN. Have you uncovered any major rings?

Colonel TUFTS. Oh, yes, we have seized—to be specific on the question, a ring at what level? I would have to address that point, at what level do you mean a ring? The ring usually comes through the traditional traffic routes. And then it is broken down in the countries on the periphery of Germany, and it comes into the Federal Republic. We might not have the big international distributor,

but I think when it comes into the Federal Republic we have broken the local distribution, and I say a big ring. When you seize over $1 million in hashish in one time, one seizure—and we only had one, I might add—you have cracked a big ring. We work with the German Police, with the other U.S. Federal agencies, with the Germans, the Dutch, and the Belgian police. We worked both in the international trafficking, distribution, and then we orient, of course, in the various areas like Nuremberg, Heidelberg, and Frankfurt, where we have large concentrations, where again you find rings at one level lower. And, of course, then we work right down to the various kaserns.

Mr. MARTIN. Do any of the rings you have found so far appear to be targeted specifically at American military personnel rather than at the general West European population?

Colonel TUFTS. Of course, we like to think—and we do say, and I believe it is true—that those people that we are working against, or that your effort is directed against, are definitely targeted on the U.S. troop concentration—unequivocally they are targeted on our people.

Mr. MARTIN. Are they targeted against the U.S. troop concentrations primarily because they consider this the most lucrative market available in Europe, or has there been any evidence of the involvement of a political motivation of some kind?

Colonel TUFTS. There has been no evidence of political motivation that I know of. And I think the answer is that probably in this country—and the doctor alluded to some of this—there are young people that are exposed to this a decade ahead of the European youth, if we are talking in terms of youth. And I think our people do have money, our people are pretty well paid, and the young person who is single does have some money available to him, in comparison to the similar aged European. And I think the market has been targeted to our people. I do not think there is any doubt about it, the market now is targeted toward the young of all the European countries more and more. And I think that probably you will have testimony here, at least in the newspapers and the magazines, that there is an apparent growth, I would not say paralleling the sad experiences we have had, but there is usage development, I think, throughout Europe, without question.

Mr. MARTIN. There appears to be no question about that.

Have any of the rings you have so far discovered involved American servicemen, or have there been any rings consisting of American servicemen primarily?

Colonel TUFTS. I cannot think offhand where you would have a ring. Again, I have to pitch to the level. In the international trafficking, or the large-scale dispensing, these groups consist mainly of Germans, Dutch, French nationals, and other third-country nationals, and some U.S. civilians, and a number of European outs, as we used to call them. This is the man that can make a dollar in Europe, and he decides to take his discharge. I think now the man has to come back to this country to be discharged. And we have evidence that there are a few people who take the trip back, get their discharge papers, and get mustered out, and they are im-

mediately back in Europe to study the arts or pursue whatever endeavor they may see fit. So we do have a few of these people who are beginning to crop up.

Mr. MARTIN. The ex-servicemen?

Colonel TUFTS. The ex-servicemen. I do not want to mislead you on my answer. When you get down to the local troop concentration levels, and when you get into the kaserne of the large troop concentration area, or as the doctor brought out, when you get down into the battalion, then you have got, as I call it, the pusher rather than the trafficker.

Mr. MARTIN. There is the military equivalent of the street pusher?

Colonel TUFTS. That is right.

General TEMPLE. If I might echo Colonel Tufts' observations, ours in the Air Force in the European area are essentially to the same effect. First of all, we have not seen evidence of a hostile political motivation in specific targeting against airbases in an attempt to corrupt the base and disrupt it. We have seen commercial exploitation by the international drug traffic of the fact that American servicemen with money to spend are there, and that our Nation has a reputation as being major drug users, and our servicemen come from our Nation. And we also have had a good deal of experience with the ring at the level at which Colonel Tufts is talking, the local serviceman taking advantage of the opportunity to make some cash and being a local distributor or pusher; obviously, since most hashish comes from the Mideast, he is the tail end of a chain which may have been an international ring, but he may not even know where the substance came from, and typically will not.

Colonel TUFTS. Do not let me leave the wrong impression when I mention rings. As I was listening to General Temple this came out pretty strongly. We do get down to, like, a division level or, like, an organizational level, and you do find what you could well categorize as a ring, some 10, 20, or 30 people, you know, in a group of 900, 200, or 3,000, sort of banded together, and they have a common purpose. But in the sense of the ring, generally, when we mention this we are talking about the large-scale manipulating group that has moved around as a combine. And we do not find the higher-ups above it.

General TEMPLE. These groups typically do not have a connection and ability to go to the country of origin and buy large quantities, and transport it.

Colonel TUFTS. And they are loosely organized, too; they are just a group of people with a common interest.

Mr. MARTIN. You are talking now about the existence or nonexistence of rings within the military establishments?

Colonel TUFTS. Yes, sir.

Mr. MARTIN. But you did, I believe, agree that there were some criminal rings operating outside the military establishment?

Colonel TUFTS. Definitely. There are many of them.

Mr. MARTIN. And you have had some successes in operating against them?

Colonel TUFTS. Yes, sir.

Mr. MARTIN. When the Drug Enforcement Administration testified before the subcommittee on May 9 they provided us with a

number of case histories—success stories of their operations against the cannabis rings. Could you provide us with a few of your more successful case histories—for the record—not at this moment?

Colonel TUFTS. Not at this moment. Some of ours, even though we talk about them as success stories, they are tied into ongoing operators and operations. And anticipating that question, I have a prepared answer that I would be happy to give you some of the success stories, even to the point of including the identity of individuals later on; I will make them available to you.

Mr. MARTIN. And if for any reason they cannot be printed in the form in which you give them to us, it will be your privilege, of course, to indicate what names or what portions of the reports will have to be deleted.

Colonel TUFTS. I think with the exception of names we can break them out where they are pretty much printable.

Mr. MARTIN. Thank you very much, Colonel.

General TEMPLE. We too would be able—subject to the problem of not interfering with a case still pending or a trial yet to come, whether of our own people or of the civilian suppliers—we would be happy to supply you with specific instances.

[The material referred to follows:]

OPERATIONS OF THE U.S. ARMY CRIMINAL INVESTIGATION COMMAND AGAINST ORGANIZED NON-MILITARY DRUG TRAFFICKING GROUPS WHO DIRECT THEIR ACTIVITIES AGAINST U.S. FORCES IN EUROPE

The following examples reflect successful operations to interdict the flow of marihuana and hashish destined for U.S. Forces in Europe. In each case, information was developed by Army Criminal Investigators and coordinated with host-country law enforcement officials who took the necessary apprehension action. Specific dates and identities have been omitted. To assist in measuring the illicit income to be derived from selling hashish and marihuana to U.S. Forces, 1 gram of hashish has a street value of $2. A kilogram of hashish has a street value of $2,000. A liter of hashish oil has a street value of $9,000.

SUMMER 1972

German police apprehended six German nationals and two Iranian nationals in possession of 1,293 kilograms of hashish and $134,000 in German and United States currency believed to be the fruits of illicit drug sales.

WINTER 1972–73

German police apprehended two Ghanian nationals in possession of 20 kilograms of hashish which they were attempting to deliver to CID Special Agents.

German police apprehended two Turkish nationals and two Lebanese nationals in possession of 25 kilograms of hashish which they were attempting to sell to CID Special Agents.

German police apprehended four Iranian nationals in two separate investigations while attempting to sell a total of 1,000 kilograms of hashish to CID Special Agents.

SPRING 1973

Amsterdam city police apprehended three Belgium nationals in possession of 7½ liters of hashish oil which they were attempting to sell to CID Special Agents.

German police apprehended four German nationals in possession of approximately 50 kilograms of hashish which they were attempting to deliver to CID Special Agents.

Amsterdam city police apprehended one Dutch national in possession of 40 kilograms of hashish.

SUMMER 1973

German police apprehended three Turkish nationals in possession of 5 kilograms of hashish which they were attempting to sell to CID Special Agents. Searches of the suspects' residence and business establishment resulted in the apprehension of five more Turkish nationals and the seizure of an additional 15½ kilograms of hashish.

FALL 1973

German police apprehended one Iranian national in possession of 86½ kilograms of hashish which he was attempting to sell to CID and DEA Special Agents.

German and Dutch police apprehended one Dutch national and one British national in possession of 117½ kilograms of hashish which they were attempting to sell to CID Special Agents.

WINTER 1973–74

German customs police apprehended one Egyptian national and one German national in possession of 40 kilograms of hashish which they were attempting to sell to a CID Special Agent.

German police apprehended one Turkish national in possession of 15 kilograms of hashish which he attempted to sell to a CID confidential informant. A search of the individual's vehicle resulted in the seizure of an additional 9 kilograms of hashish.

German customs police apprehended three Turkish nationals, one Tunisian national, and one German national while attempting to sell 15 kilograms of hashish to a CID Special Agent.

Dutch police apprehended one Indian national and one Dutch national in possession of 50 kilograms of hashish, secreted in cans of fish, which they were attempting to sell to a CID Special Agent. Subsequent investigation resulted in the seizure of 10 kilograms of hashish in a cafe in The Hague, The Netherlands, and 171 kilograms of hashish secreted in compressor parts in Antwerp, Belgium.

German police apprehended two French nationals in possession of 200 kilograms of hashish which they were attempting to sell to CID Special Agents.

SPRING 1974

German police apprehended one German national and one Austrian national in possession of 3 liters of hashish oil which they were attempting to sell to a CID Special Agent.

Spanish police apprehended one Iranian national and one German national in possession of 148 kilograms of hashish concealed in a camper-type trailer which they were attempting to transport into Germany for resale. Undercover operations by CID Special Agents provided the information on which host-country law enforcement officials acted.

U.S. Army Criminal Investigation Command additionally has one Special Agent assigned to the Military Assistance and Advisory Group in Iran who is instrumental in coordinating Iranian and European efforts to stem the flow of hashish smuggling from Afghanistan, through Iran, to Germany. Prior to the increased emphasis placed by host-country customs officials in searching trucks engaged in international commerce, Iranian Customs Police and the CID Special Agent Adviser seized over 1,500 kilograms of hashish within false truck compartments that was destined for resale in Germany.

Mr. MARTIN. What about the Navy?

Mr. COOKE. The Navy experience, I suppose, would be primarily on the other side of the world, and in particular the Philippines and Southeast Asia.

Mr. MARTIN. This would have the advantage of establishing the fact that it is an international problem, if you could provide us with a number of such case histories.

Mr. PLANTON. Our tack in the Navy is a little bit different from that of the Army and Air Force. What we attempted to do in the

Philippines, rather than trying to dry up all the narcotics, was to develop a climate so that the traffickers there would not sell to our sailors, 7th Fleet sailors. Our program was aimed specifically at the street-level vendors. With the winddown of the Vietnam war, our 7th Fleet ships are now showing our flag in Hong Kong, Singapore, and other ports in the Far East. We have expanded our program to those areas in concert with the governments there, working close at hand with DEA representatives where they exist. Our successes since we developed this program in December 1972 through March 1974, are that our operations have resulted in the apprehension of over a thousand individuals. And in the case of Singapore, there, the Singapore Police, based on information which our team developed in concert with them, confiscated in addition to drugs, 11 taxis which were worth $86,000. And so as a consequence, when American ships, Navy ships, go in there, now, taxicab drivers who used to be in the forefront of the trafficking just will not have anything to do with "Yankee sailors."

Mr. MARTIN. That might create some difficulties.

Is it accurate, Mr. Cooke, that our drug educational program, that is, the drug educational program, in our armed services, are governed by guidelines promulgated by the National Institute for Drug Abuse, or do you set up your own guidelines?

Mr. COOKE. I think we are aware of the standards. But we tailor our guidelines to meet our needs. And I would like to call upon Dr. Mazzuchi, who is the assistant for Education and Information, Drug and Alcohol Abuse, for the Assistant Secretary of Defense (Health and Environment).

Dr. MAZZUCHI. We are not bound by the media guidelines. However, we cooperated with them. When Dr. Dupont called the moratorium for the production of specific drug abuse and educational materials, he requested cooperation from the Secretary of Defense. And through the Assistant Secretary of Defense, Dr. Wilber, and now Dr. Cowan, we have cooperated with him in this effort when the preliminary guidelines were developed and they were sent to our office for comment. And we did comment rather intensively on these guidelines. And we sent them back to Dr. Dupont through Dr. Cowan's office. Subsequent to receiving these guidelines, the committee for media support, which is composed of the Department of Defense—and I am the representative—Lt. Col. Maine from the Office of Information of the armed services, and then information officers as well as drug education officers from the other service branches, met as a committee, and adopted similar guidelines, very similar to the guidelines for the screening of media support, especially film, but also pamphlets, so that outside companies as well as internal development of films meet these guidelines to the best of our ability to do so. And then we then recommend or fail to recommend films or pamphlets that are given to us for screening.

Mr. MARTIN. You referred to preliminary guidelines. The subcommittee has heard of a document entitled "New Information Guidelines," from which I would like to quote a few sentences, and then you can tell me whether this is the same document as the preliminary guidelines to which you referred. The document started

out: "The following kind of messages have been found to be generally counterproductive, and as such should be excluded from use in general informational terms." It then listed ten no-no's, ten approaches that should not be used in attempting to educate military personnel against drug abuse. And point number 1 was that "the use of drug X always causes condition Y." And point number 2 was that "any messages couched in terms which tend to scare the subject and make fear the main deterrent to future use also should not be used."

The other eight directives listed made pretty good sense. One of them said that you were never supposed to say that drug abuse is exclusively a youth problem, or that the use of drug X never causes conditions Y—I do not know who would want to say that. But is this the document in question?

Dr. MAZZUCHI. Yes, these were contained in the preliminary guidelines. And we then received a final copy of these guidelines, and it was from this final copy that the Media Support Committee drew up its own guidelines which have embraced all of the guidelines from the special action office. I think these guidelines are subject to interpretation.

And I would like to comment for a moment on this scare tactic type film. What we interpret, the Military Media Committee interprets as the scare tactic types are those films or pamphlets that try to rely on exaggerated claims or very frightening tactics, such as, there have been films out in the past which are really very poor, especially films dealing with heroin abuse where they showed people who had overdosed with the heroin being treated in the hospital, and in a rather bloody fashion, with the obvious intent of the film to frighten the audience rather than to give them factual information. We do not consider it a scare tactic to give factual information. Some of the factual information itself might be frightening, such as calling to mind a recent change in the material on methapalone, which is a depressant type nonbarbiturate which was originally thought to be safe and is now considered to be not safe. Some of the material on methapalone would, I suppose, tend to frighten somebody who has not used it and who might have thought of using it; reading some of the material he might decide that he does not want some of these possibilities to happen to him, the possibility of addiction and of a rather serious type of overdose potential. So that by scare tactics we in the committee basically use the criteria of, is the information being presented factually, and is it being presented in a factual way, or is it being exaggerated and sensationalized in such a way as to frighten the person?

Mr. MARTIN. Have you had an opportunity to read any of the testimony presented before the Senate subcommittee in its recent hearing?

Dr. MAZZUCHI. I was present for all of it and have also read all of it. And that type of testimony we would not consider—to me it is very frightening, so the possibility of cannabis use, especially if some of the preliminary findings are borne out by other studies, it would be indeed frightening. But this would not constitute a scare tactic, this is factual information.

Mr. MARTIN. So that this kind of information would be usable within the framework of the current guideline?

Dr. MAZZUCHI. Yes, it would be.

Mr. COOKE. Let me say, I am sure, speaking for all of us, we intend to take the material developed by the subcommittee and use it in furtherance of our educational program. And we would welcome such material.

Mr. MARTIN. I am sure the Members of the subcommittee will be very pleased to know that the armed services find the information of some validity and some use.

I have one final question. Mr. Cooke, do you feel it would simplify the problem the armed services confront in dealing with the problem of cannabis abuse if the Government were to decide, as it did in the case of the heroin epidemic, that we are confronted as a Nation with a very serious situation that calls for an all-out national effort, and if it then launched the kind of all-out campaign against cannabis that we launched several years ago against the heroin epidemic—with considerable success. Would that simplify your problems?

Mr. COOKE. I think the answer is, of course, yes, because as we pointed out, our people come from the American society, and to the extent to which that society reduces the use of cannabis, why our problems will be immeasurably simpler.

Mr. MARTIN. Are there any other statements?

Mr. COOKE. I would like to add one observation, that at times there seems to be a thread running through your questioning that, because there is at least strong empirical evidence that cannabis creates a climate and aura of susceptibility in the user, it is not possible that this is a security problem, because then it is conceivable that hostile intelligence agents would target it. It seems to me that if I were a representative of a hostile intelligence agency I would be looking for rather reliable informants, and the very factors which would enhance susceptibility of suggestion would also markedly decrease his value as a possible target. That is a thing I have sort of been thinking about. And I would like to hear from General Temple, who, among the investigative agencies present here, and also Mr. Planton, are responsible for counterintelligence.

Mr. MARTIN. Let me throw in a thought that they might consider in responding to you. From the little knowledge that I have of how intelligence agencies operate, I have the impression that they try to recruit people at many different levels, from a very low level to a very high level.

General TEMPLE. That is true, sir. But in our experience—and perhaps it would tend to explain the point I made in the Air Force investigations—we have not come across a case in which a hostile agent played on a man's addiction, for example, to recruit him. It is rather clear that hostile agents who have any intelligence of our operations are looking, No. 1, for a person who can be had, but at the same time, a person who occupies a responsible position where he has access to the sort of information that the hostile agency is concerned with, and who is reliable and able to carry out very precise and detailed instructions. And assuming the psychiatric char-

acteristics of the cannabis users, for example, if I were a hostile intelligence agent, the last man I would waste much effort attempting to recruit is the pothead in the particular service who, No. 1, is likely to get busted by his own service at any time, wasting my effort, and No. 2, may be a very poor risk in carrying out any instructions.

All of this goes to say that we are concerned with the job diminishment, if that is the security sense in which you use the word security, of any member of the Armed Forces who is intoxicated on duty due to any cause whatsoever.

Mr. MARTIN. Are there any other observations, Mr. Cooke?

Mr. COOKE. No, as I said at the outset, we welcome the opportunity to appear before you. We will be glad to supply the information you requested for the record, and we think we have a strong ongoing program across the whole spectrum of efforts, and we intend to keep up with it.

And I can also say that I believe in our judgment, these hearings of the subcommittee will prove of value not only to the Armed Forces but certainly to the Nation at large.

Mr. MARTIN. I want to thank you and your colleagues for your testimony today, Mr. Cooke.

I have no further questions to ask you.

Mr. Chairman, I hope that we will have the completed testimony available for distribution in about 4 to 6 weeks.

Mr. COOKE. Thank you very much.

[Whereupon, at 5:10 o'clock p.m., the hearing was adjourned subject to the call of the Chair.]

APPENDIX

This portion of the appendix consists of a series of scientific papers dealing with the effects of cannabis.

The first in this series of papers was specially prepared for the Subcommittee on Internal Security by Professor Arthur M. Zimmerman of the University of Toronto, in response to a letter from Chairman James O. Eastland.

Some of the other papers, taken from recent scientific publications, were covered in somewhat less technical terms in the presentations made before the subcommittee by the scientists in question. A number were ordered into the record in the course of the hearing. Others have been included in the Appendix at the request of Senator Gurney because they contain information that was omitted from the oral presentations and because it was felt that scientific readers might wish to refer to the original articles.

In addition, Senator Gurney requested the publication in the Appendix of several scientific papers which either help to fill in some of the gaps left by the testimony of the scientific witnesses, or which are of interest because they were referred to repeatedly by the witnesses.

U.S. SENATE,
COMMITTEE ON THE JUDICIARY,
SUBCOMMITTEE ON INTERNAL SECURITY,
Washington, D.C., June 14, 1974.

Dr. ARTHUR M. ZIMMERMAN,
Department of Zoology,
University of Toronto,
Toronto, Ontario, Canada

DEAR DR. ZIMMERMAN: As you may have heard, the Senate Subcommittee on Internal Security has recently held extensive hearings on cannabis which, among other things, sought to throw light on the effects of cannabis on the human organism. One of our witnesses, Dr. Gabriel Nahas of Columbia University, has suggested that it would help to round out the evidence we have already assembled if you were invited to provide the Subcommittee with a report dealing with your recent research on the effects of THC on DNA and RNA synthesis and on the cellular process in general. While it would be out of the question to schedule any additional hearings at this juncture, a report on your research could be incorporated in the printed record of our recent hearings if you could manage to get it to us before June 21. It would be helpful if your report could be written in language understandable to an intelligent layman with a smattering of scientific knowledge.

I hope it will prove possible for you to cooperate with us in this matter.

Sincerely,

JAMES O. EASTLAND, U.S.S.

STATEMENT OF ARTHUR M. ZIMMERMAN, PH.D., UNIVERSITY OF TORONTO, TORONTO, ONTARIO, CANADA

[Dr. Arthur M. Zimmerman is Professor of Zoology at the University of Toronto. Born in New York City on May 24, 1929, he attended New York University where he obtained his B.A., M.Sc., and Ph.D. degrees. He was instructor of pharmacology at the State University of New York from 1958 to 1960 and Assistant Professor of Pharmacology from 1960 to 1964. He has been in his present position as Professor of Zoology at the University of Toronto since 1964. He is the author or co-author of 57 scientific papers, and the editor and co-editor of four scientific books.]

Summary of Findings on the Effects of THC on Cell Metabolism and Division

These studies clearly demonstrate that delta-9-tetrahydrocannabinol (THC) at a modest dosage reduces the growth and delays cell division of a uni-cellular protozoan *Tetrahymena*. These effects on cell growth are related to a depression of cell metabolism, i.e. a reduction of DNA, RNA and protein synthesis. The effects of THC are reflected in a reduction in the cell's ability to synthesize and assemble RNA which is an essential component of the protein synthesis system. The reduced cell synthesis, in the presence of THC, may be attributable to the reduction of DNA synthesis which is known to direct cell metabolism.

Delta-9 tetrahydrocannabinol (THC), the psychoactive component of marihuana, has been shown to reduce cellular growth, delay cell division, and interfere with DNA, RNA and protein synthesis in a carefully controlled cellular system, *Tetrahymena pyriformis*. *Tetrahymena*, a unicellular ciliated protozoan, serves as an excellent model for studying the effects of drugs on cells. Effects on cell division are readily demonstrable in this system in which cell division synchrony[1] can be readily achieved; evaluation of drug effects is facilitated by reference to the extensive background of biochemical and physiological data which has been accumulated on these cells.

The growth of *Tetrahymena* in log phase cultures,[2] over a period of 24 hours, is reduced in the presence of 9.6 μM[3] THC. When concentrations are increased above 16 μM there is further reduction in growth rate accompanied by extensive cytolysis (cellular breakdown). Cultures of *Tetrahymena*, which are thermally treated so as to divide synchronously, display cell division delays in the presence of THC. The effects of THC on the division schedule is dependent on the concentration and duration of exposure as well as the stage during the cell cycle at which the THC treatment is initiated. The studies with division synchronized cultures complement and support the log growth experiments. THC causes cell division delays and a reduction in the division indices; THC at concentrations of 3.2, 9.6, 16.0 μM cause division delays of 5, 15 and 20 min, respectively.

The dosage of THC employed in these studies can be compared to the THC which can be found in a "joint" (marihuana cigarette). If the THC (4–8 mg) from 1 or 2 marihuana cigarettes were extracted and were found in the body fluid of a human (14 liters of body fluid in a 70 kg human), the cellular fluid surrounding cells might contain as much as 0.3 to 0.6 μg/ml[4] which is 1–2 μM.

Cellular biosynthesis (metabolism) is markedly inhibited in the presence of 9.6 μM THC. The greatest reduction is found in RNA synthesis, followed by reductions in DNA and protein synthesis. The protein synthesizing system in *Tetrahymena* is affected by THC. This is reflected in a reduction in the amount of nascent (new) proteins which are synthesized in THC treated organisms. Moreover, there is a reduction in the amount of polyribosomal material[5] available for protein synthesis; in addition the synthesis of the various types of RNA (ribosomal precursor RNA, 25S RNA, 17S RNA, 5S RNA and 4S RNA) which are essential components of the protein system are partially inhibited following the treatment of cells with THC.

Details of Research

Cell Growth

The exponential growth rates of *Tetrahymena pyriformis* in nutrient medium containing various concentrations of THC (3.2–24 μM) were determined by

[1] "Cell division synchrony" is a condition in which all cells present in the culture evolve and divide simultaneously.

[2] "Log phase culture" is a culture in which the cells evolve and divide in a random manner.

[3] "μM" is a measurement of the strength of a solution. It stands for micromolar, which is one one-millionth of the molecular weight of a substance taken up in a liter of saturated solution.

[4] "μg/ml"—micrograms per milliliter (millionths of a gram per thousandths of a liter).

[5] "Polyribosomal materials"—a ribosome consists of protein and RNA. In polyrobosomal material, the ribosomes are found in clusters.

establishing the increases in cell number over a period of 24 hours. The growth rate was depressed 11% with 9.6 μM THC and 18% with 24 μM at 16 hours exponential growth.

The cytological observations were made in conjunction with these growth studies. After 1 hour exposure to THC at 3.2 and 9.6 μM the normally pyriform cells were ovoid and somewhat rounded in shape; cell motility was sluggish and swimming pattern was irregular. At 16 and 24 μM THC the cells were predominately rounded in shape, motility was very sluggish and the swimming pattern was concentric or static. These obesrvations were more apparent after 2 hours of exposure. Some cells displayed cytolysis[6] at this 2 hours time, at concentrations of 16 μM or greater.

Cell Division

Exponentially growing *Tetrahymena* were induced to divide synchronously by a series of 8 alternating thermal treatments. These cells proceed through a division maxima 70 minutes after the last thermal treatment. Immediately after the last thermal treatment cells were incubated with THC at concentrations of 3.2–32 μM THC. The effects of THC on the division schedule were dependent on the concentration and duration of THC treatment as well as the stage during the cell cycle at which the THC is applied. Delay of division varied from 2.5 min at 3.2 μM, 15 min at 9.6 μM and 20 min at 16 μM THC. The percentage of cells that completed division 1 was correlated with the drug dose. Cell mounts showed that 91% divided at 3.2 μM, whereas 54% divided at 16 μM.

Changes in division index (the percentage of cells showing division furrows) resulting from THC treatment were analyzed as a function of time after the last thermal shock. Cells incubated with 3.2 μM THC showed division maxima of 75% which was delayed 2.5 min relative to controls. In the presence of 9.6 and 16 μM THC cells showing maxima of 50 and 30% were delayed 15 and 20 min, respectively.

Studies were also conducted in which cells were exposed to THC for short time intervals and then allowed to recover. Cells were pulsed with 9.6 μM THC for 10 min at various times preceding the first synchronous division. The cells were most sensitive to THC when the drugs were applied during the middle of the cell cycle, at which times division delays of 50 min were recorded. Application of the drug earlier or later during the cycle caused division delays of 10 to 20 min.

Macromolecular synthesis

Experiments were conducted to establish the effects of continuous exposure to THC (3.2 or 9.6 μM) on the incorporation of radioactively labelled precursors into acid precipitable material. The incorporation of ^{14}C thymidine, ^{3}H uridine, ^{14}C phenylalanine or ^{14}C sodium acetate was used as an index of DNA, RNA, protein or lipid synthesis respectively.

Incorporation of uridine into RNA was preferentially depressed by THC treatment (9.6 μM) over the exposure interval of 100 min. Incorporation of thymidine into DNA and phenylalanine into protein was also reduced. The relative depression of incorporation for the RNA fraction was 70%, DNA fraction 30% and protein fraction 35%.

Cellular polysomes

Division synchronized *Tetrahymena* were incubated with 9.6 μM THC for 55 min. The cells were lysed and the polysomes were extracted and characterized. The analysis indicated that there was a reduction in the amount of polysomal material extractable from THC treated cells. The activity of cell polysomes is reflected by their association with newly synthesized RNA and in the synthesis of nascent (new) polypeptides (proteins). To monitor these activities cells were treated with radioactive amino acids and radioactive uridine in the presence of THC for 10 min and the polysomes were isolated and subject to analysis.

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[6] "Cytolysis"—involves the disintegration of cells, particularly through the destruction of the surface membrane.

After treatment with THC, polypeptide (protein) synthesis was depressed by approximately 60% and the activity of rapidly labelled RNA (messenger RNA) was depressed by approximately 80% as calculated by specific activities.

Cellular RNA

The previous studies suggested that THC caused reduction in RNA and protein synthesis. In order to determine the nature of inhibition of RNA synthesis the effect of THC on the synthesis of the various species of RNA was conducted. Nucleic acids were fractionated on methylated albumin kieselguhr columns. Synchronized cells were treated with 9.6 μM THC for 55 min in the presence of radioactive uridine. Synthesis of 4S RNA and 5S ribosomal RNA fractions were depressed. Ribosomal RNA fractions 17S and 25S RNA showed a 50% reduction as compared to controls.

Studies were also conducted in which cells were exposed to THC for 10 or 15 min and the RNA of these cells was analyzed. Short pulses of THC (32 μM) show that ribosomal RNA and 4S RNA species were markedly affected early and late during the cell cycle. Ribosomal precursor was most significantly inhibited. The heterogeneous high molecular weight RNA species and the tenuously bound RNA (presumed to be messenger RNA) were depressed at about half the level of control non-treated cells.

[From Science, Jan. 26, 1973, volume 179, pages 391–393]

Delta-9 Tetrahydrocannabinol: Localization in Body Fat

(By David S. Kreuz and Julius Axelrod, Laboratory of Clinical Science, NIMH)

Abstract. [^{14}C]Δ^9-Tetrahydrocannabinol (Δ^{9}THC) was injected subcutaneously in rats every day for 1 to 26 days. Concentrations of Δ^{9}THC and its metabolites, 11-hydroxytetrahydrocannabinol and 8,11-dihydroxytetrahydrocannabinol, were determined in various tissues. After a single injection, the concentration of Δ^{9}THC in fat was ten times greater than in any other tissue examined, and persisted in this tissue for 2 weeks. With repeated injection, Δ^{9}THC and its metabolites accumulated in fat and brain.

Previous studies have shown that [^{14}C]Δ^9-tetrahydrocannabinol (Δ^{9}THC) persists in the plasma of man for several days after its intravenous administration (*1*) and that, after a single injection of [^{3}H]Δ^{9}THC to experimental animals, total radioactivity remained in fat (*2, 3*) and brain (*4*) for several days. A major metabolite of Δ^{9}THC, 11-hydroxytetrahydrocannabinol (11-hydroxy THC) (*5, 6*), is behaviorally active in animals (*5*) and humans (*7*), whereas 8,11-dihydroxytetrahydrocannabinol (8,11-dihydroxy THC) has been demonstrated to be a nonactive metabolite (*1, 5, 8*).

Because of the lipophilic nature of Δ^{9}THC, its persistence in plasma might be due to sequestration in and slow release from fat. In chronic marihuana users the effects of Δ^{9}THC might result from accumulation of Δ^{9}THC or an active metabolite in brain. We now describe the selective accumulation and retention of Δ^{9}THC and its metabolites in fat after single and repeated subcutaneous doses of [^{14}C]Δ^{9}THC to rats.

Female Sprague-Dawley rats weighing 150 g were injected subcutaneously just below the scapula every other day with 14 μl of an ethanol solution (1 mg/ml, 17.5 μc/mg) of [^{14}C]Δ^{9}THC (*9*). Forty-four hours after 1, 3, 6, 9, or 13 doses of the THC solution, four rats were decapitated. The brain, lung, and parts of the liver and perirenal fat pads were homogenized, and the Δ^{9}THC, 11-hydroxy THC, and 8,11-dihydroxy THC were separated and measured by extraction into heptane of various polarities (*10*).

There was a tenfold greater concentration of Δ^{9}THC in fat than in the other tissues (Fig. 1A), and there was a fourfold increase over the initial concentration in fat with repeated injection. In brain Δ^{9}THC could not be detected at day 2, but by day 7 could be measured (0.37 ng per gram of tissue), and this concentration doubled by day 27.

The accumulation of 11-hydroxy THC, the active metabolite of Δ^{9}THC, shows a similar distribution (Fig. 1B) except that its concentration in fat, although

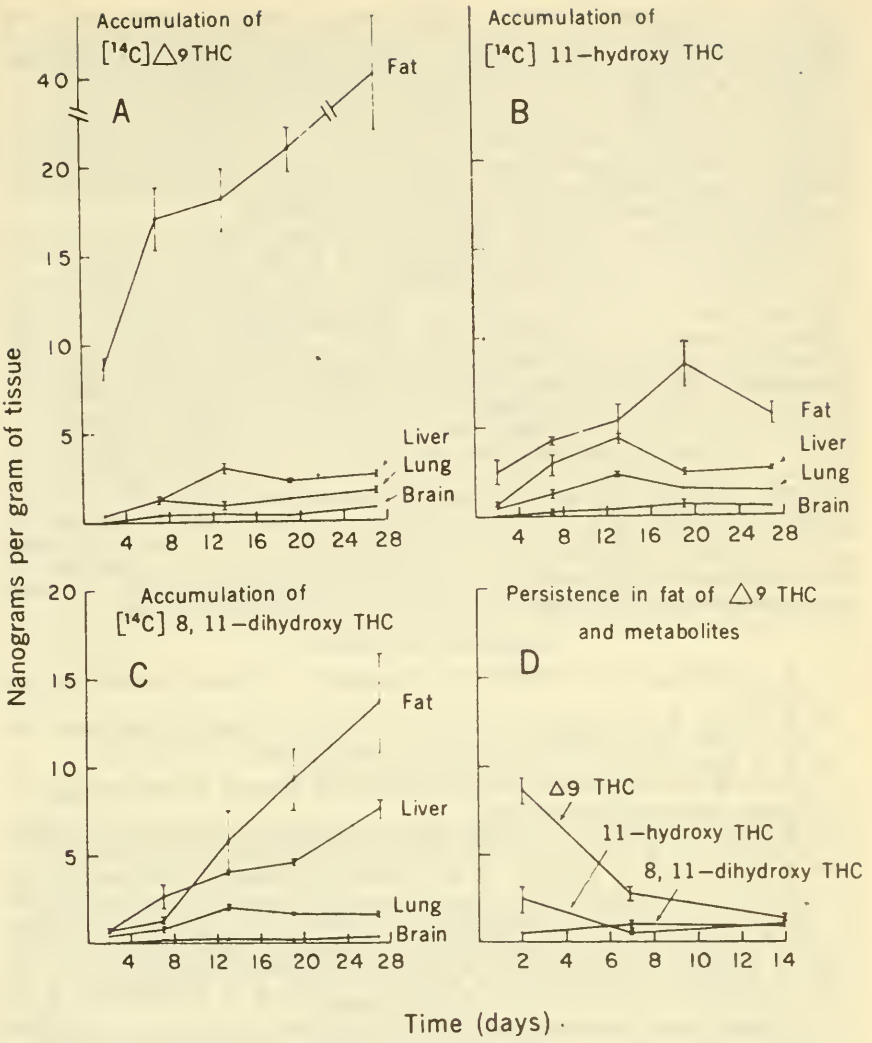

Fig. 1. The distribution of Δ^9THC, 11-hydroxy THC, and 8,11-dihydroxy THC in rat tissues after repeated subcutaneous doses of [^{14}C]Δ^9THC. (A to C) The [^{14}C]Δ^9THC was given every other day for the stated number of days. (D) A single dose of [^{14}C]Δ^9THC was given, and tissues were examined at the times indicated. Results are expressed as mean ± standard error of the mean for four animals at each time point.

higher than that for the other tissues, was less than that of Δ^9THC in fat. In brain, 11-hydroxy THC was undetectable at day 2 but by day 27 reached a concentration of 0.45 ng per gram of tissue.

The accumulation of 8,11-dihydroxy THC (Fig. 1C) is similar except for fivefold greater accumulation in liver than in lung; 8,11-dihydroxy THC has been shown to be formed readily in vitro in liver but not in lung (*11*).

The retention of Δ^9THC and its metabolites in fat (Fig. 1D) and the other tissues was examined by injection of a single dose of [^{14}C]Δ^9THC and analyzing the tissues periodically over 14 days for Δ^9THC and metabolites. An approximate

half-life of 5 days was found for Δ^9THC in fat, while 11-hydroxy THC and 8,11-dihydroxy THC persisted in smaller amounts over 14 days. In liver small amounts (0.44 ng per gram of tissue) of Δ^9THC and its metabolites were present for 14 days, while in lung similar amounts were present for 2 days only.

Estimates were made of the residual unidentified polar metabolites (*12*). After 13 doses of [^{14}C]Δ^9THC, there were negligible amounts in brain, small amounts in fat (0 to 5 ng per gram of tissue) and lung (3 to 10 ng per gram of tissue) and large amounts (30 to 60 ng per gram of tissue) in liver. The amounts of polar metabolites accumulating in liver and lung were greater than the sum of Δ^9THC, 11-hydroxy THC, and 8,11-dihydroxy THC in these tissues.

The disappearance curve for Δ^9THC in the plasma of man (*1*) and of total radioactivity in rats (*2*) shows an initial rapid decline (half-time of minutes) after intravenous administration followed by a long slow phase (half-time of days), suggesting that Δ^9THC is rapidly taken up in tissues or metabolized or both. Since the disappearance curve for total metabolites is also biphasic (*1*), and Δ^9THC is present in plasma for a week after a single tracer dose (*1*), it is probable that tissue sequestration, especially in fat, plays a dominant role in the disposition of Δ^9THC. The importance of fat localization of drugs in explaining their duration of action has been shown for drugs such as thiopental (*13*), dibenamine (*14*), and DDT (*15*). These drugs show a similar biphasic disappearance curve from plasma, a high localization in fat, and a comparable rate of accumulation in fat with repeated administration. DDT reaches maximum levels in fat of man after 1 year of the normal amounts found in food (*16*). If the period of injection of Δ^9THC had been extended over a longer time, the plateau for Δ^9THC accumulation in fat might reach a much higher value than that reported in Fig. 1A. With starvation, DDT concentrations increase in rat brain because of mobilization from fat stores (*17*). It would be of interest to study this phenomenon in those chronic marihuana users who report flashback (*18*).

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(*9*) A Hamilton microsyringe was used. Examination of the injection site after 13 injections revealed no gross pathological changes, and an ethanol extract of the tissues at the site revealed 500 to 1000 count/min.

(*10*) The tissues were homogenized in three volumes of KH_2PO_4–Na_2HPO_4 buffer (0.05*M*, *p*H 7.0) with a Polytron homogenizer. Four volumes of heptane were added, and the mixture was agitated with a Vortex mixer for 1 minute, then shaken in a mechanical shaker for 30 minutes. After centrifugation at 1500*g* for 10 minutes, the organic extracts were dried with a gentle stream of nitrogen at room temperature to a volume of 0 to 4 ml, to which 1 ml of ethanol and 10 ml of phosphor were added for determination of radioactivity in a Packard scintillation counter. The samples were counted for 20 to 50 minutes to obtain statistical significance, and correction was made for quenching by channel ratio. The organic extracts used for chromatography were dried completely, then 50 to 100 μl of ethanol was added for application to Eastman silica gel sheets. This heptane extraction was followed sequentially by identi-

cal procedures with two other solvent mixtures: heptane and 1.5 percent isoamyl alcohol, and heptane and 3 percent isoamyl alcohol. The heptane extracted 90 percent of the Δ^9THC, 10 percent of the 11-hydroxy THC, and none of the 8,11-dihydroxy THC, whereas the heptane containing 1.5 percent isoamyl alcohol extracted the remaining Δ^9THC, 60 percent of the total 11-hydroxy THC, and 20 percent of the 8,11-dihydroxy THC. The final extraction with heptane and 3 percent isoamyl alcohol recovered the remaining 11-hydroxy THC, and 60 percent of the total 8,11-dihydroxy THC. The amounts of each of the three compounds were determined by simultaneous equations. The precision and specificity of the method was confirmed three times on three thin-layer chromatography systems (hexane: acetone, 3: -: chloroform: ethanol, 19: 1, chloroform: acetone, 9: 1). The partitions in all four tissues were the same. The standard error of the mean for these procedures was 1.1 percent (N=16).

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(*12*) Two 0.5-ml fractions were taken from each homogenate and from the final residue after the three organic extractions. To each fraction 1.5 ml of NCS solubilizer (Nuclear-Chicago) was added, and the tissue was digested for 1 to 2 days (until a clear solution was obtained). Two drops of a 1 percent solution of $SnCl_2$ were added (to reduce chemifluorescence) plus 1 ml of ethanol and 10 ml of phosphor. There was, however, considerable variation between duplicates.

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[From Science, Feb. 1, 1974, Vol. 183, pp. 183–420]

Inhibition of Cellular Mediated Immunity in Marihuana Smokers

(By Gabriel G. Nahas, Nicole Suciu-Foca, Jean-Pierre Armand, and Akira Morishima, Dept. of Anesthesiology, Surgery and Pediatrics, College of Physicians and Surgeons, Columbia University)

Abstract. The cellular mediated immunity of 51 young chronic marihuana smokers, as evaluated by the lymphocyte response in vitro to allogeneic cells and to phytohemagglutinin, was significantly decreased and similar to that of patients in whom impairment of T (thymus derived) cell immunity is known to occur. This inhibition of blastogenesis might be related to an impairment of DNA synthesis.

It has been previously reported (*1*) that delta-9-tetrahydrocannabinol (Δ^9-THC), a psychoactive substance of cannabis, when administered to rodents alters their cellular mediated immune responsiveness, and it was suggested that similar changes might also occur in man. In our study the mixed lymphocyte culture (MLC) and phytohemagglutinin (PHA) responsiveness of 51 marihuana smokers, 16 to 35 years old (median age 22), were studied. Only subjects who had used cannabis products (at the exclusion of other drugs) at least once a week (average four times a week) for at least 1 year (average 4 years) were selected for this investigation.

Eighty-one healthy volunteers, 20 to 72 years of age (median age 44) were used as controls. Purified lymphocyte suspensions were prepared from fresh samples of venous blood by the Ficoll-Isopaque density gradient method (*2*). A microculture system was used for screening of cellular responsiveness (*3*). For the MLC test, 1×10^5 responding cells were incubated, per well, with 2×10^5 stimulating cells pooled from a panel of ten donors, phenotypically different [allogeneic cells in which 25 different HL–A specificities were represented (*4*)].

TABLE 1.—COMPARATIVE CELLULAR MEDIATED IMMUNITY OF NORMAL SUBJECTS, MARIHUANA SMOKERS, AND PATIENTS WITH IMPAIRMENT OF T CELL IMMUNITY. THE IN VITRO BLASTOGENIC RESPONSE OF LYMPHOCYTES WAS STUDIED BY THE MLC AND THE PHA TESTS. THE INCORPORATION RATE OF [^{3}H]THYMIDINE OF THE T LYMPHOCYTES IS GIVEN IN COUNTS PER MINUTE ± THE STANDARD ERROR

Subjects	MLC		PHA	
	No. tested	[^{3}H]Thymidine incorporated (count/min)	No. tested	[^{3}H]Thymidine incorporated (count/min)
Normal controls	81	26400±200	81	23250±210
Cancer patients:				
Primary tumors	16	14894±792	16	17501±124
Regional spread	23	15816±420	23	13345±540
Distant spread	21	8968±459	21	10516±580
Uremic patients	26	12001±272		
Transplant patients [1]	24	12307±357		
Marihuana smokers [2]	34	15679±499	51	13779±169

[1] After 1 to 4 years of immunosupressive therapy.
[2] At least 1 year, at least once a week; no other drug taken.

For the PHA test, 2×10^5 responding cells were incubated per well with 1 μg of purified PHA. The medium used was RPMI 1640 with penicillin, streptomycin, and glutamine, to which 25 percent autologous serum was added.

Results are summarized in Table 2 and compared with data obtained in 60 patients with cancer, 20 patients with uremia, and 24 renal allograft recipients with iatrogenically induced immunosuppression. The mean values registered in the group of marihuana users were significantly lower than those of the normal, but much older, control group. Since an inverse correlation exists between cellular immunity, as reflected by in vitro lymphocyte blastogenesis and aging (*5*), results obtained in the group of marihuana smokers may be interpreted as being indicative of cellular hyporesponsiveness. Supporting this conclusion is the close similarity between the depressed MLC and PHA responsiveness of marihuana users and that of cancer (*6*), uremia (*7*), and immunosuppressed transplant patients in whom impairment of T (thymus derived) cell immunity is known to occur. Furthermore, we observed that in vitro inhibition of PHA-induced blastogenesis of normal human lymphocytes started with 1.6 μM THC and was complete with 20μM.

The major psychologically active constituent of cannabis *sative* is Δ^9THC. This substance, as well as its metabolites, is insoluble in H_2O, but is very fat soluble, and has a half-life of several days in tissues where it might exert a cumulative and pharmacological effect (*8*). Such an effect might be related in a still unknown way to the depressed cellular immune response in vitro of chronic marihuana smokers. The effect of THC on adrenergic receptors (*9*) might also play a role in its immunosuppressive activity, as was suggested for other drugs administered continuously over a long period (*10*).

This inhibition of blastogenesis might result from an impairment of DNA synthesis. One of us (A.M.) sampled lymphocytes from four marihuana smokers, cultivated the cells for 72 hours, and then observed a decreased number of cells during the period of DNA synthesis (S period of the cell cycle). There was also an increased incidence of chromosomal breakages, such as that observed by others (*11*), and an increase in the prevalence of micronuclei. Since it has been shown that lymphocytes of normal individuals will undergo three or four divisional cycles during 72 hours of culture (*12*), the observed micronuclei might indicate that there is an increased anaphase lag with or without chromosomal breakage during the preceding cell divisions in vitro. Anaphase lag, formation of hypodiploid cells, and alterations of DNA content were also observed in cultures of human lung explants exposed to marihuana smoke (*13*). Tetrahydrocannabinol in 3 to 9 μM concentration inhibits the growth of tetrahymena by reducting DNA and RNA synthesis (*14*).

Further studies are required to elucidate the exact mechanism by which marihuana products might affect DNA synthesis and the genetic equilibrium of T (thymus derived) lymphocyte population.

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[From American Journal of Obstetrics and Gynecology, Jan. 1, 1974]

Chromosome Breakage in Users of Marihuana

(By Morton A. Stenchever, M.D., Terry J. Kunysz, and Marjorie A. Allen, Salt Lake City, Utah)

Forty-nine users of marihuana (29 male and 20 female) and 20 control subjects (12 male and 8 female) were studied with peripheral blood lymphocyte cultures for the presence of chromosome breaks and abnormal forms. An average of 3.4 cells with breaks per 100 cells (range 0 to 8) were noted in the user group, and 1 to 2 cells with breaks per 100 cells (range 0 to 5) were noted in the control group. No significant differences were noted in chromosome breakage between "heavy" and "light" users, users of mixed drugs when compared to users of marihuana only, users of marihuana and caffeine when compared to marihuana users not using caffeine, and male and female users. There were increases in numbers of cells with abnormal chromosome configuration in users as compared to control subjects, but the numbers were too small to be significant. The possible significance of these data is discussed.

The observation that psychoactive drugs could cause chromosome damage in users was introduced by Cohen and associates (*1, 2*) and Egozcue and colleagues (*3*). It was first reported that chromosome damage occurred because of the use of lysergic acid diethylamide (LSD). However, a number of studies since that time have cast doubt on whether this drug actually damages the chromosomes of users (*4–6*) and, in a recent review of the literature, Lang (*7*) concluded that it probably did not. Most users of LSD also use other drugs, particularly marihuana. Gilmour and co-workers (*8*) found no increase in chromosome aberrations in "light" users of marihuana. However, they did find an increase in chromosome breakage in 11 "heavy" users. In most cases, all of these users were taking multiple drugs. In a study of rat cells, Pace

and associates (*9*) could find no significant increase in chromosome breakage after exposure of the cells to marihuana in vitro. Studies by Neu and colleagues (*10*) and Stenchever and Allen (*11*) yielded no increased incidence of chromosome breakage in in vitro experiments in human cells exposed to delta-9-tetrahydrocannabinol, one of the active ingredients in marihuana. Marihuana, however, is a composite of a number of agents, and its effects on chromosomes is still to be defined.

It is the purpose of this presentation to report results of the effect of marihuana use on the chromosomes of a group of healthy college students.

MATERIAL AND METHODS

Forty-nine users (29 male and 20 female) and 20 control subjects (12 male and 8 female) were studied concurrently. The average age of the users was 22.3 years (range 17 to 34) and the average age of the control subjects was 28.7 years (range 13 to 52). All of the users were college students. Some of the control subjects were college students; others were members of the staff, working at the University. No individual in the control group was exposed

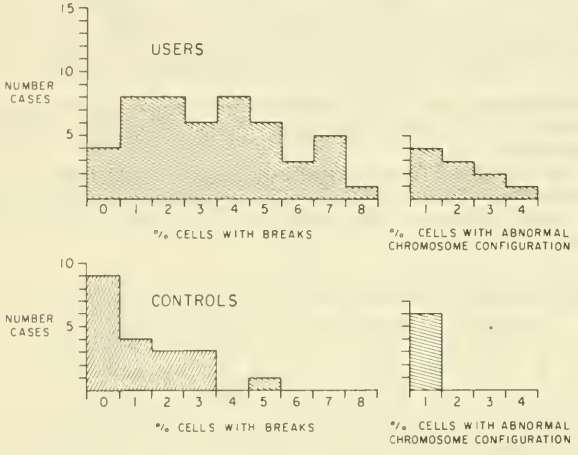

Fig. 1. Per cent cells with chromosome breaks and abnormal forms in marihuana users and control subjects.

to any drugs or medication for 6 months prior to the study, other than an occasional aspirin, and none had been exposed to ionizing radiation of any type for 6 months or more. A few used nicotine, and most used caffeine. The major purpose of the control group was to test the method continuously for the incidence of chromosome breakage. A careful history was taken from each user and control subject and included exposure to all drugs and pesticides, including the name of the agent, the dates exposed, and the dosage, as close as could be estimated, exposure to x-irradiation, serious illnesses, pregnancy history, history of caffeine use (including coffee, tea, and cola), and the use of cigarettes, including the number smoked per day. The use of marihuana was tabulated for each user according to date and amount used, classification of drugs as estimated by the user, and the presence of any other drugs that were used concurrently. All users smoked as their means of ingestion. Marihuana had been used for a minimum of 6 months and a maximum of 9 years (average 3.0 years) and previously had been used between 5 hours and 30 days prior to the study.

From each subject, 10 c.c. of heparinized blood was obtained and treated with phytohemagglutinin for 30 minutes in ice. Following this, a specimen was centrifuged at 500 r.p.m. for 5 minutes. The lymphocyte-containing sera were separated into three equal portions in small Erlenmeyer flasks. Dulbecco's modified Eagle's medium with penicillin and streptomycin were added to each

flask to make a final volume of 10 ml. The flasks were then cultured at 37°C. for 72 hours. Two hours prior to harvesting, 0.3 ml. of Demecolcine[7] (10 mcg. per milliliter) was added to each flask, and harvesting was carried out with the use of an air-dry technique. Slides were stained with carbofuchsin and scored for the presence of chromatid and isochromatid breaks and abnormal forms. A chromatid break is described as a separation in a chromatid arm with a dislocation of the fragment or with a separation greater than the width of the chromosome arm. An isochromatid break is similarly defined except that the breaks occur on the identical spot of both sister chromatids. Chromatid and isochromatid gaps were also scored but were not included in the analysis of the data because of the uncertainty of their biological significance. Abnormal forms are described as tetraploid cells, cells with quadriradials, triradials, rings, or dicentric configurations, or cells with multiple fragmentation. One hundred consecutive intact-appearing spreads were scored for each patient. The individual doing the scoring did not know whether the preparation was from a patient or a control subject. All cells with breaks or abnormal forms were photographed for verification.

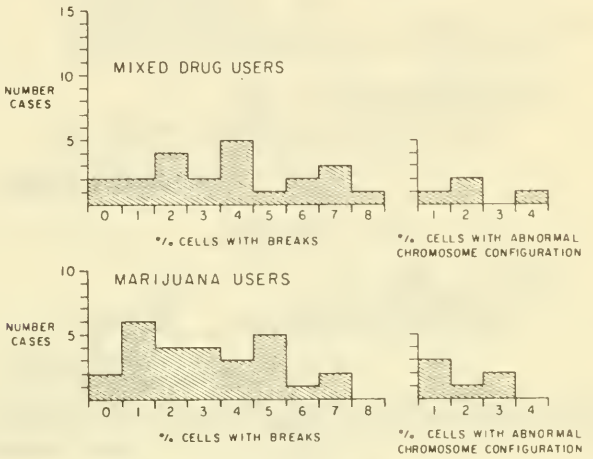

Fig. 2. Per cent cells with chromosome breaks and abnormal forms in users of mixed drugs and users of marihuana alone.

RESULTS

Does marihuana use cause chromosome damage? Fig. 1 compares graphically the breakage experience in breaks per 100 cells between the study group and the control subjects. There was an average of 3.4 cells with breaks (range 0 to 8) per 100 cells per user and 1.2 cells with breaks (range 0 to 5) per 100 per control subject. The difference is significant ($p = 0.05$). While the abnormal form data appear to be different for the two groups, the numbers involved are too small to be significant. The majority of abnormal cells seen were tetraploid cells and cells with fragmented chromosomes, with only one triradial and one dicentric cell occurring in the study group and none in the control group.

Does the concurrent use of other drugs influence the extent of chromosome damage? Fig. 2 compares graphically the distribution of frequency of breaks in users of marihuana only with those who have used other drugs as well. Other drugs in this instance include barbiturates, amphetamines, tranquilizers, mescaline, LSD, and heroin. While a variety of usage patterns occurred in these subjects, no attempt was made to separate cases of use of each of the other agents as numbers would be very small. Users of marihuana alone had an average of 3.1 cells with breaks per 100 cells, whereas users of mixed drugs

[7] Ciba Pharm. Co., Summit, New Jersey.

had 3.7 cells with breaks per 100 cells. These differences are not significant at the $p = 0.05$ level.

Does the frequency of use relate to the extent of damage? Fig. 3 compares the frequency of chromosome breakage in a group of individuals who were considered to be heavy users (more than 2 exposures per week) with a group of individuals known to be light users (one or less exposure per week). Light users had used the drug between 6 months and 9 years (average 2.9 years) and had last used it 18 hours to 30 days before the study (average 5.4 days). Heavy users had used the drug 9 months to 7 years (average 3.4 years) and had last used the drug 5 hours to 5 days (average 1.4 days) prior to the study. Twenty-seven users fell into the "heavy" use category and had an average breakage rate of 3.8 cells per 100, while 22 users were in the "light" category and had a breakage rate of 3.2 cells per 100. The difference is not significant at the $p = 0.05$ level.

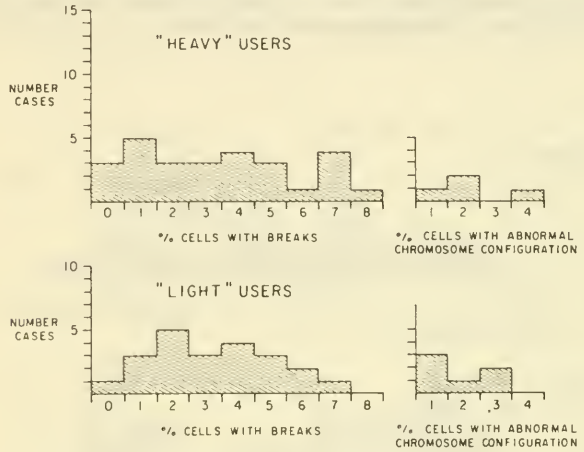

Fig. 3. Per cent cells with chromosome breaks and abnormal forms in heavy and light users of marihuana.

Does the use of caffeine as well as marihuana influence the extent of chromosome damage? Fig. 4 compares the frequency of chromosome breaks in marihuana users who also used caffeine in various forms with those who did not. Attempts were made to define the amount of caffeine used per day. This was carried out by ascertaining the average amount of coffee, tea, and cola used by an individual in estimating the average amount of caffeine consumed per day. This is, of necessity, a rough estimate. Forty-three individuals were users, and 6 were not. Comparing two such groups is difficult, but, nonetheless, the distribution of chromosome breaks in each group is such that no influence of caffeine is suggested. Because of the unequal numbers, tests of significance were not applied.

Do male and female subjects respond differently to marihuana with respect to chromosome damage? Fig. 5 compares the frequency of chromosome breaks between male (29) and female (20) subjects. Male subjects had an average breakage rate of 3.7 cells per 100, and the rate for female subjects was 2.9 cells per 100. This difference was not significant at the $p = 0.05$ level.

Since both chromatid and isochromatid breaks occurred and no pattern of breakage was noted, all breaks were tabulated as "total breaks." Fig. 6 shows examples of chromosome breaks seen.

COMMENT

The data presented in this study seem to indicate that the use of marihuana is a cause of chromosome breakage in lymphocytes of users. Multifactorial analysis on computerized data carried out in this experiment comparing variables of sex of individual, marihuana use, use of other drugs, and use of

caffeine demonstrated a positive correlation at the $p = 0.05$ level only for the variable of marihuana use and chromosome breakage. In addition, the data seemed to show that the degree of use is not critical as light users (those using marihuana one time or less per week) had about as great a chance of having chromosome breakage as did heavy users. Thus, it appears that with respect to chromosome breakage the type of exposure afforded by the breaking agent even with occasional use is strong enough to do damage. This is in contrast to the observations of Gilmour and coworkers, (*8*) but it must be pointed out that a larger series of patients is reported here than was used by these authors.

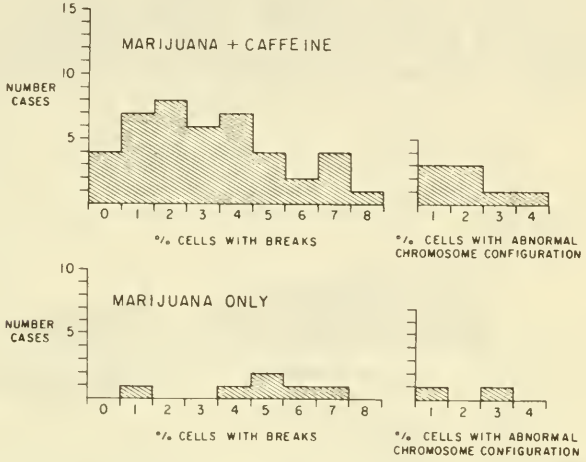

Fig. 4. Per cent cells with chromosome breaks and abnormal forms in users of marihuana and caffeine and marihuana alone.

Individuals studied in this series were college students whose general nutrition and health were generally good. Unlike early studies of the effects of mind-expanding drugs on chromosomes, the variables of malnutrition, chronic infections, etc., seem less to be in effect.

One of the major problems that the observations presented in this paper raise is a question of which compound or compounds absorbed by marihuana use are actually causing chromosome breaks. It is also possible that a metabolite of some compound of marihuana produced in the body is responsible for the damage. One of the active ingredients of marihuana is delta–9 tertrahydrocannabinol, but it has been shown by Neu and colleagues (*10*) and Stenchever and Allen (*11*) that this agent does not break chromosomes in vitro. Therefore, it seems appropriate that other known compounds present in marihuana should be studied in an in vitro system to try to identify specifically which compound or compounds are doing the damage. Should this be fruitless, an attempt to identify other metabolites and to study these in the in vitro system would seem appropriate.

Perhaps one of the more important questions that these data raise is that the blame that had been placed on LSD as a chromosome-breaking agent may indeed have belonged to marihuana. It is now reasonably well accepted (*7*) that LSD in most cases is not the cause of chromosome damage. Since most individuals using LSD in cited studies had also been using other drugs, notably marihuana, it is possible that marihuana had indeed been the cause of the chromosome damage noted. Such speculation becomes extremely important when one considers the possible teratogenic effect of such drugs. In a recent article by Jacobsen and Berlin (*12*) entitled "Possible reproductive detriment in LSD users," it was pointed out that, in 140 women and their consorts who had admitted to the use of LSD prior to or during pregnancy, 148 pregnancies led to the birth of 83 live children, 8 of whom had major congenital defects.

Fifty-three therapeutic abortions produced 14 embryos, 4 of which had gross defects. In addition, there was a probable increase in the spontaneous abortion rate and in the amount of infertility noted over what might have been expected by chance. These patients were using other drugs, and the most interesting observation was that 100 percent of them had used marihuana. (*12*) While it is possible that LSD was indeed the teratogenic agent in this series and equally possible that problems occurred in these patients because of a combination of drug uses, marihuana must still be considered a candidate for the prime agent causing these reproductive problems. Since marihuana is widely used, particularly in the young individuals of our society, this possibility takes on a spectrum of overwhelming significance.

A major consideration in any experiment recording chromosome damage is the legitimate question of what specifically chromosome damage implies. Certainly, x-irradiation and some viruses are capable of causing chromosome breakage, and it would appear that a variety of other agents including mari-

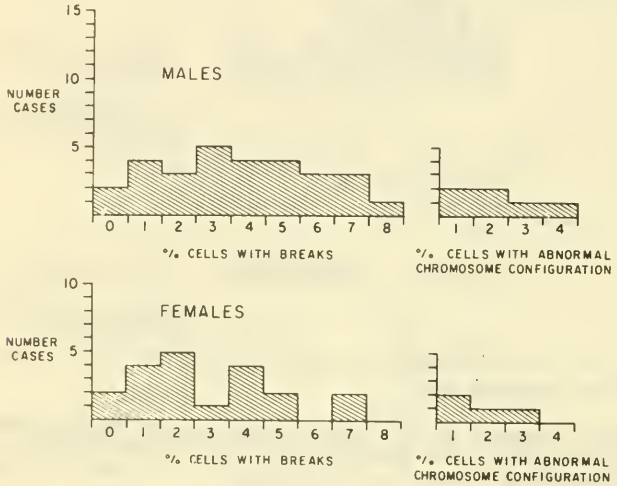

Fig. 5. Per cent cells with chromosome breaks and abnormal forms in male and female users.

Fig. 6. Examples of chromatid (*A* to *E*, *G*, and *H*) and isochromatid breaks (*F*) seen in cells of users.

huana are also capable of this damage. Specifically, most of the data available are tangential data and neither prove nor disprove that a chromosome-breaking agent is dangerous. X-ray is known to cause damage which will persist, and in these individuals both teratogenesis and neoplasia seem more prevalent. Certain disease states such as Bloom's syndrome, (*13–15*) Fanconi's anemia, (*16, 17*) and ataxia telangiectasia (*18*) have been shown to be associated with chromosome breakage; in all such instances, the presence of neoplasia and production of fetuses with congenital malformations are more common. If the agent is specifically active before chromosome division takes place, an isochromatid break will usually be found, whereas, if the agent acts after chromosome division, a chromatid break will be seen. Both types of abnormalities were seen with about equal frequency in our observations, giving rise to the possibility that the active agent responsible for the chromosome damage was acting at different periods of the cell cycle. If it has a direct affect on deoxyribonucleic acid replication, the possibility that it also behaves as a mutagen cannot be overlooked. While observations here were made on lymphocytes, it may be assumed that other cells of a body are equally susceptible to the damage taking place. Should gonadal cells be involved, the possibility of teratogenesis cannot be overlooked. Should the individual be pregnant at the time of use, a direct effect on the fetus may occur. Should other tissues of the body be involved, the possibility for eventual neoplasia must be considered. Only a long-term observation of large numbers of users will determine which of these many possibilities are actually realities. Still, because of the common use of this agent, it would seem that these observations are essential.

Final comments about the technique are appropriate. It is essential that experiments seeking chromosome damage be specifically controlled. The essential nature of the control is that the method for ascertaining chromosome damage be continually tested. The prime purpose of the control group in this experiment was twofold. The first was to furnish a continuous monitoring of the tissue culture and cytologic methods so that any variation in the laboratory which would lead to greater chromosome damage would be noted immediately without reflecting necessarily on the drug under study. In our laboratory, over the past several years, a spontaneous chromosome breakage rate of between 1 and 2 per cent has been observed continually. Except for occasional periods when virus infections are prevalent, we have not seen this breakage rate exceeded. The second important purpose of the control group is to help in eliminating bias in observations by the experimenters. By continually adding control subjects to the study population, the individual making observations for chromosome breaks does not know whether the culture observed is from a user or a control subject. Thus, the opportunity for bias is lessened. In this particular experiment, every damaged cell was photographed and reviewed by the chief investigator. Two individuals, one from the control group and one from the patient group, were found to have active herpetic lesions about the face at the time the cultures were performed. The patient from the study group demonstrated 7 per cent breakage while the control subject had 5 per cent breakage. To our knowledge, however, no other subject suffered from viral infections at the time of study.

In view of the data presented in this study, it would seem prudent that further observations with respect to chromosome damage cause by marihuana use be documented. Further studies should include an attempt with an in vitro system to identify which ingredients or metabolites are responsible for chromosome damage and animal experiments to determine whether marihuana is teratogenic or carcinogenic; these should be carried out as soon as possible. The magnitude of the problem is overwhelming when one considers the number of young people using this drug and the priority assigned to such studies should be thus the highest possible.

The authors acknowledge Kathryn Parks, Leslie Jerominski, and Marc Stenchever for technical assistance and Stanley Pace for statistical evaluation of the data.

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[From Neuropharmacology 1–14, 1973]

Marihuana: Effects on Deep and Surface Electroencephalograms of Rhesus Monkeys

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(Accepted 21 April 1972)

SUMMARY

Six rhesus monkeys prepared with electrodes implanted into numerous specific subcortical brain sites and over the brain surface under the skull were exposed to smoke of marijuana containing a significant quantity of delta-^{9} tetrahydrocannabinol. Electroencephalograms were obtained before, during, and after exposure to the marijuana smoke, which was delivered to the monkeys by use of a specially designed head chamber. Control agents for the study were inert marijuana of low delta-^{9} tetrahydrocannabinol content, tobacco, alcohol and methamphetamine.

Exposure to smoke of active marijuana consistently induced distinct recording changes in the septal region, occasionally accompanied by changes in recordings from the cerebellum, postero ventral lateral thalamus, hippocampus, and orbital and temporal cortices. Only generalized electroencephalographic changes, consisting of slight shifts in the dominant frequency, were obtained in association with the other agents used in the study.

Studies conducted in lower animals (dogs, rabbits, cats, rats) give some indication that brain recordings from deep nuclear masses are affected more than surface recordings by the active ingredients of marijuana (Hockman, Perrin and Kalant, 1971; Boyd and Meritt, 1966; Christensen, Best and Herin, 1971; Bose, Saifi and Bhagwat, 1964). Hockman *et al.* (1971) reported considerable delta activity and fast high-emplitude spindling from the amygdala, ventramedial hypothalmus, hippocampus, and a number of cortical areas in association with administration of delta-^{9} tetrahydrocannabinol (THC) to cats. Christensen *et al.* (1971) reported predominantly hippocampal and septal changes with THC in rats.

No studies have been found, however, of the effects of marijuana or its known ingredients on the function of deep brain structures of sub-human primates. The present report concerns the effects of marijuana smoke on deep and surface electroencephalograms (EEGs), as well as on behavior, of rhesus monkeys in which electrodes had been implanted for long-term study. For comparison, the effects of methamphetamine, alcohol and tobacco smoke were also studied.

METHOD

Six feral-raised rhesus monkeys (3–6 yr old), obtained through the Tulane Medical School Vivarium, were used for this study.

Electrode implantation

The operative procedure, which has previously been described (Heath, John and Fontana, 1968), was carried out under Nembutal anaesthesia with roentgenographic visualization of the ventricular system after pneumoencephalography. Two types of silver-ball electrodes (Lustick and Heath, 1971) were

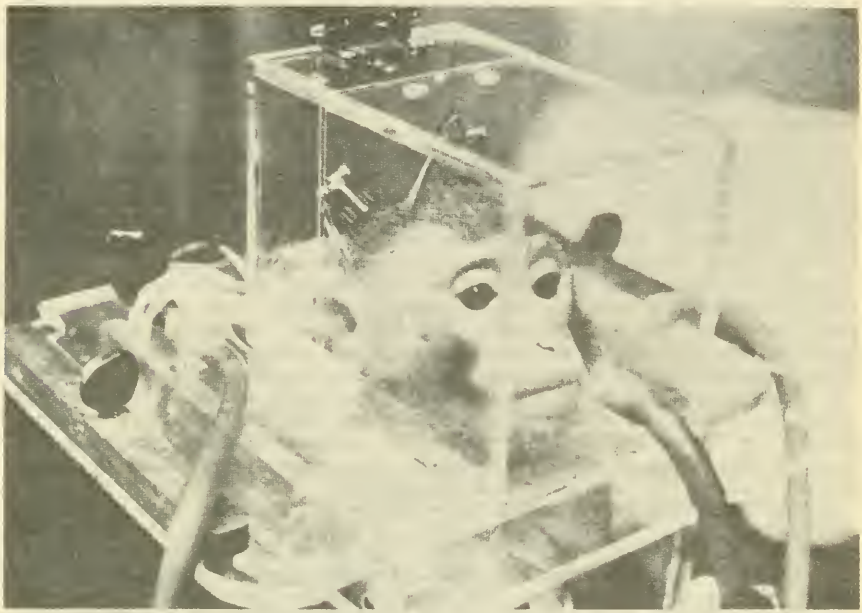

Fig. 1. Transparent plastic box apparatus used to pump marijuana and tobacco smoke to monkeys.

stereotaxically implanted into a variety of deep sites and over the cortex of the brain: a single ball electrode 0.025 in. in diameter and a bipolar electrode composed of two silver balls 0.08 in. apart, each 0.015 in. in diameter. The electrodes were soldered to two 10-place plugs which were fixed with Craniopiastic to the skull. All six monkeys had electrodes implanted into the following 8 sites: right septal region, right dentate nucleus of the cerebellum, right fastigius nucleus of the cerebellum, postero ventral lateral thalamus, hippocampus bilaterally, mesencephalic reticulum, and over the right temporal cortex. The remaining electrode placements varied: in two monkeys, single (monopolar) silver-ball electrodes were also implanted into the caudate nucleus and the hypothalamus (mammillary bodies) and over the frontal and occipital cortices; two other monkeys had bipolar electrodes into the centramedian thalamus and the orbital cortex; and two had bipolar electrodes over the cerebellar cortex and into the orbital cortex.

Each monkey was allowed to rest for 3 weeks after implantation, to permit all recording artifacts consequent to the operation to disappear. At the end of the studies, the monkeys were killed and the brains fixed in 10% formalin for later sectioning and staining by the Kluver-Berrara method, to permit histologic study which established the absence of notable brain damage at electrode tips (Lustick and Heath, 1971) and verified accuracy of the electrode placements.

Recording procedures

Electroencephalographic (EEG) recordings were obtained on a 12-channel Grass Model VI electroencephalograph. A 7-channel Ampex FR 1300 recorder

was used to record samples of significant recordings simultaneously on magnetic tape. The EEGs and the magnetic tape recordings were synchronized with an EECO (Electronics Engineering Co. of California) 858–A time code generator/reader with one EEG channel used as a marker for the generator. Another EEG channel was used to record activity from over the heart to indicate pulse rate.

Activity of the right temporal cortex and of the right anterior septal region during both baseline recordings and at intervals after exposure to both marijuana and tobacco smoke were analyzed to determine brain activity in the canonical delta, theta and alpha bandwidths. The measure of activity was the average of the absolute amplitude. For this analysis an Electrophysiological Monitor and Event Detector (EMED) was used which integrates energy at predetermined frequencies (Heath, 1972a). Significance of the activity in each of the canonical delta, theta, and alpha bandwidths at these sites was obtained with a two sample *t*-test.

Test materials and mode of administration

Marijuana.—Marijuana was obtained by court order from Federal narcotics agents. For this study, two different batches of marijuana were used. Assay by gas chromatography of the crude petroleum ether extract from the dried leaves showed that one batch contained 2.29% THC (referred to hereafter as active marijuana). The other batch, in contrast, contained a barely detectable quantity (0.1%) of THC (referred to hereafter as inert marijuana).

Marijuana smoke was delivered to the monkeys by use of a specially fabricated transparent plastic box placed over the animal's head (Fig. 1). A pipe was fixed to the box, and by means of a rubber bulb, the smoke was pumped from the pipe into the plastic box; it was mixed sufficiently with air or with oxygen pumped through another opening to prevent anoxia.

It was not possible by this procedure of delivering smoke to the monkeys (both marijuana and tobacco) to estimate the quantity of active material absorbed by inhalation. Since the period of exposure to smoke for each test reported here was the same (5 min), it was assumed that about the same amount of smoke was inhaled on each occasion.

During the exposure of one monkey to marijuana smoke and to tobacco smoke, air samples were obtained of both the room air and the air within the smoke box and blood-gas analyses were made on an Instrumentation Laboratory I.L.–313 blood-gas analyzer. Blood samples were obtained before exposure, during 5-min exposures (to both marijuana and tobacco smoke on separate occasions), and at 10, 30, and 60 min after exposure to smoke.

Each of the 6 monkeys studied was exposed to marijuana smoke 2–5 times.

Tobacco.—The smoke from a standard brand of pipe tobacco was delivered to the monkeys by use of the same apparatus that was used for delivery of marijuana smoke.

Alcohol.—Each monkey received 5 ml of a solution consisting of 2.5 ml U.S.P. absolute ethyl alcohol diluted with 2.5 ml water and injected i.v. at a rate of 1.0 ml/min.

Methamphetamine.—Each monkey received 0.25 mg/kg of body weight of methamphetamine injected i.v.

RESULTS

Active marijuana (2.29% delta-^{9} tetrahydrocannabinol)

The behavioral responses of the 6 monkeys to the active marijuana smoke were consistent, as were the responses of individual monkeys to repeated exposure to the smoke, although the intensity of the responses varied. All displayed dilated pupils and sharp reduction in level of awareness. The monkeys would stare blankly into space, sometimes displaying spontaneous nystagmus, and would become much less attentive or completely unresponsive to environmental stimuli. When their hands or feet were grasped, the clasping response, which was consistently elicited on baseline examinations, was absent. Responses to pain (pinprick) and to sound (hand claps) were minimal to absent. Although the monkeys were not particularly drowsy, spontaneous

motor movements were notably slowed, and passive tests of muscle tone suggested a degree of catatonia, although true waxy flexibility never developed.

Electroencephalographic changes, which always accompanied the behavioral changes, consistently began within 1–3 min after the monkey's initial exposure to a high concentration of active marijuana smoke. They became increasingly pronounced over a period of the next 5 min and then remained distinct for at least 30 min. At that point the recording usually began a return toward baseline, and generally in another hour the recording again resembled the baseline EEG. With each exposure, the pulse rates of the monkeys increased from 50 to 100%.

Although there were similarities in the EEGs of the 6 monkeys, there were variations as well. A consistent feature was the profound change that occurred in recordings from the septal leads. On occasion only this site was affected, but usually other sites showed changes as well. When only the septal region was affected, a delta wave at a frequency of 3–4 Hz characteristically appeared (Figs. 2 and 3). Occasionally, a sharp wave was interspersed with this focal delta activity. This slow wave and occasional sharp wave activity was intermittent, bursts lasting 5–10 sec appearing every 20–30 sec. Sometimes the slow wave in recordings from the septal region was accompanied by a similar wave (frequency of 2–4 Hz) recorded from the mesencephalic reticulum or the postero ventral lateral thalamus, or both, while no significant changes appeared in recordings from other deep structures or from the surface (Figs. 4 and 5).

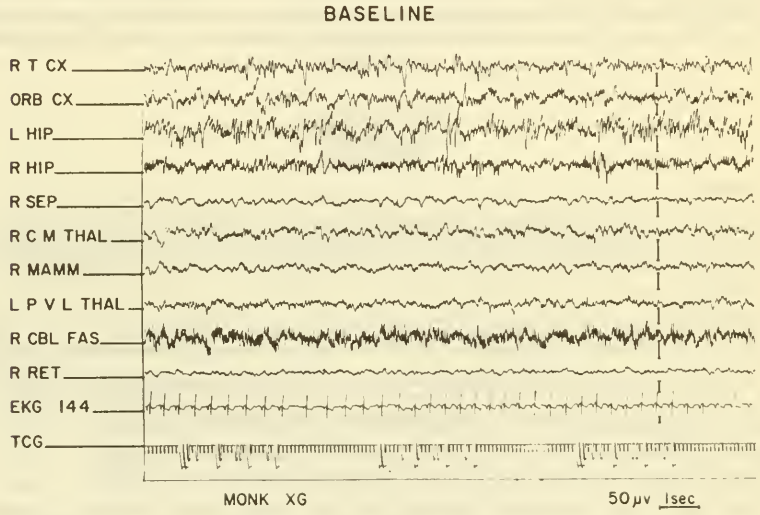

Fig. 2. Baseline deep and surface EEGs obtained from Monkey XG. R T CX: right temporal cortex; ORB CX: orbital cortex; L HIP: left hippocampus; R HIP: right hippocampus; R SEP: right septal region; R C M THAL: right centromedian thalamus; R MAMM: right mammilary body; L P V L THAL: left postero-ventral lateral thalamus; R CBL FAS: right cerebellum fastigius; R RET or R MES RET: right mesencephalic reticulum; R HYP: right hypothalamus; R A SEP: right anterior septal region; EKG or PULSE: EEG channel indicating pulse rate; TCG: EEG channel used as marker for time code generator. (These abbreviations also apply to the other EEG figures in this paper.)

Another frequent recording change was the appearance of bursts of high-amplitude spindles (approximating 16 Hz), most pronounced in the septal leads but occasionally present in other deep leads and over the temporal cortex (Figs. 6–8). The presence of spindles at other sites was sometimes synchronous

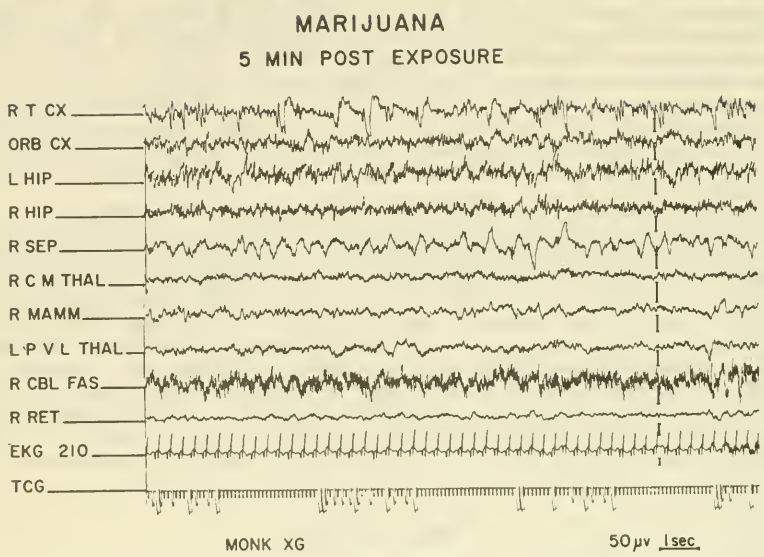

Fig. 3. Deep and surface EEGs obtained from Monkey XG 5 min after exposure to marijuana smoke. Note focal delta activity in the septal lead. Artifact caused by eye-blinking is seen in the right temporal cortex lead.

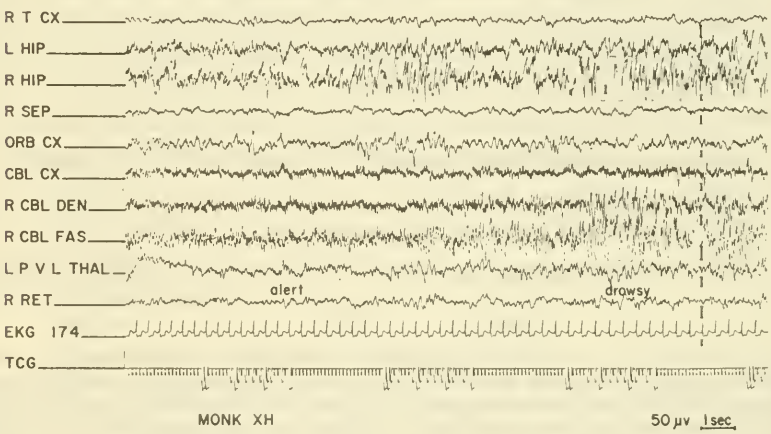

Fig. 4. Typical baseline EEGs obtained from Monkey XH.

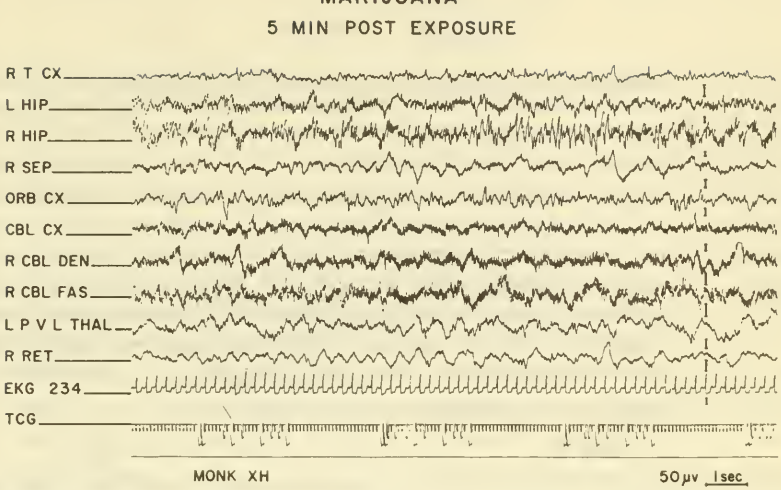

Fig. 5. EEGs obtained from Monkey XH 5 min after exposure to marijuana smoke. Note delta activity in the right mesencephalic reticular (R RET) and left postero-ventral lateral thalamic leads along with focal slowing in the septal lead.

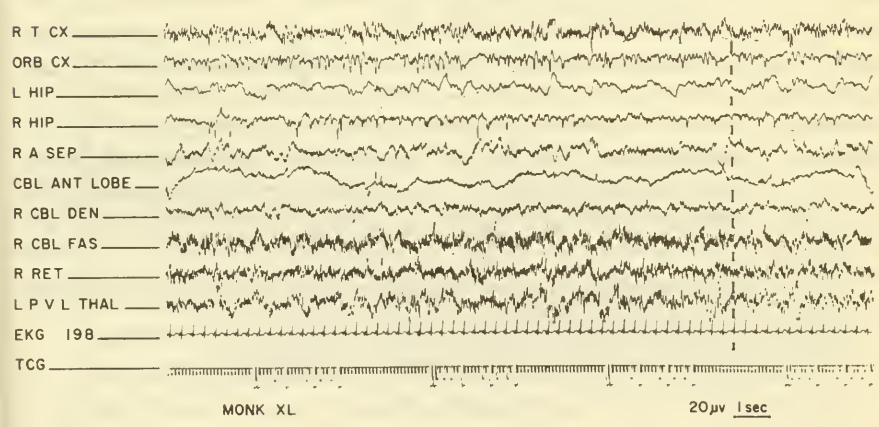

Fig. 6. Typical baseline EEG obtained from Monkey XL. The pulse rate of the animal was rapid when this recording was made. Post-marijuana recordings (Figs. 7 and 8) do not show the monkey's maximal pulse rate increase which did occur.

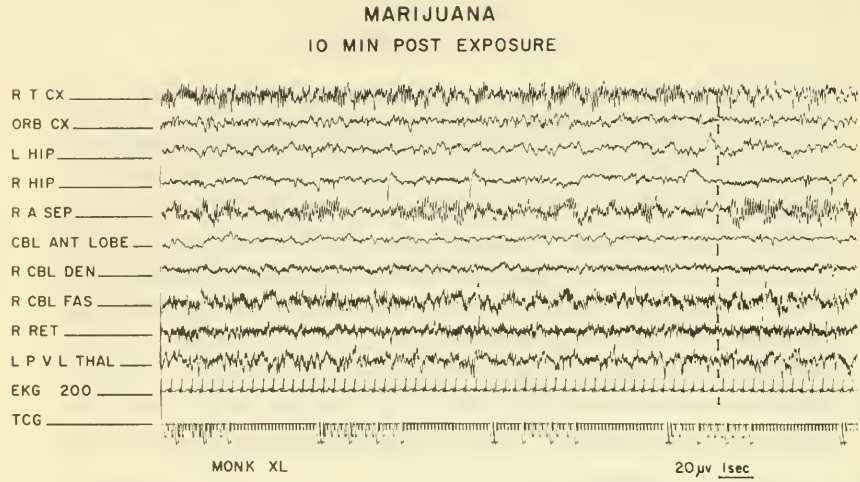

Fig. 7. EEG from Monkey XL 10 min after exposure to marijuana smoke. Note spindling at certain sites.

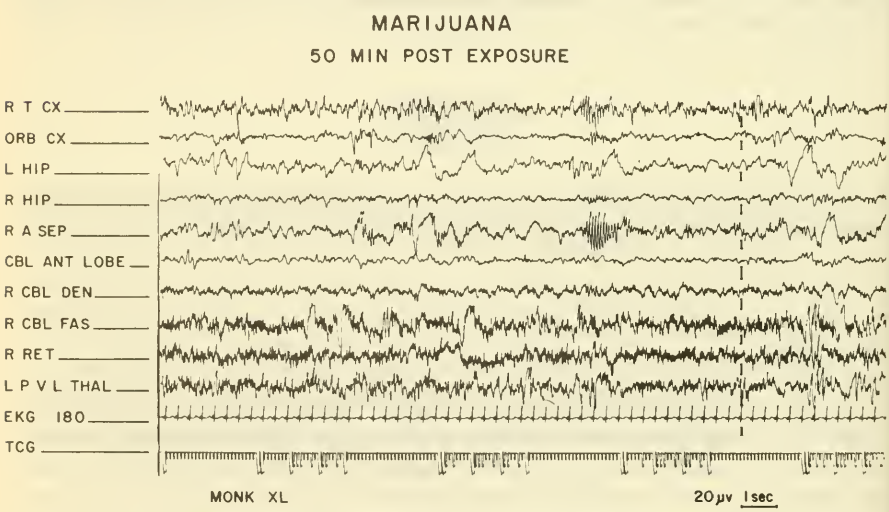

Fig. 8. EEG from Monkey XL 50 min after exposure to marijuana smoke.

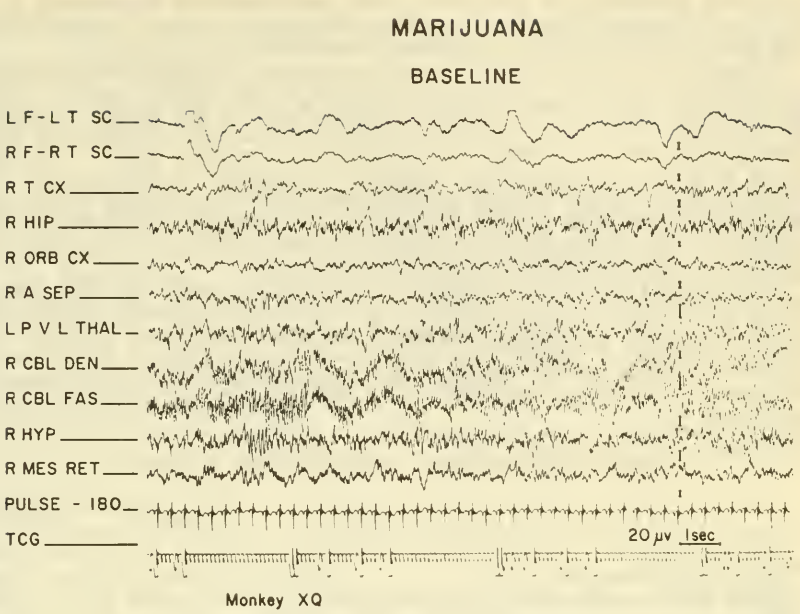

Fig. 9. Baseline EEG obtained from Monkey XQ.

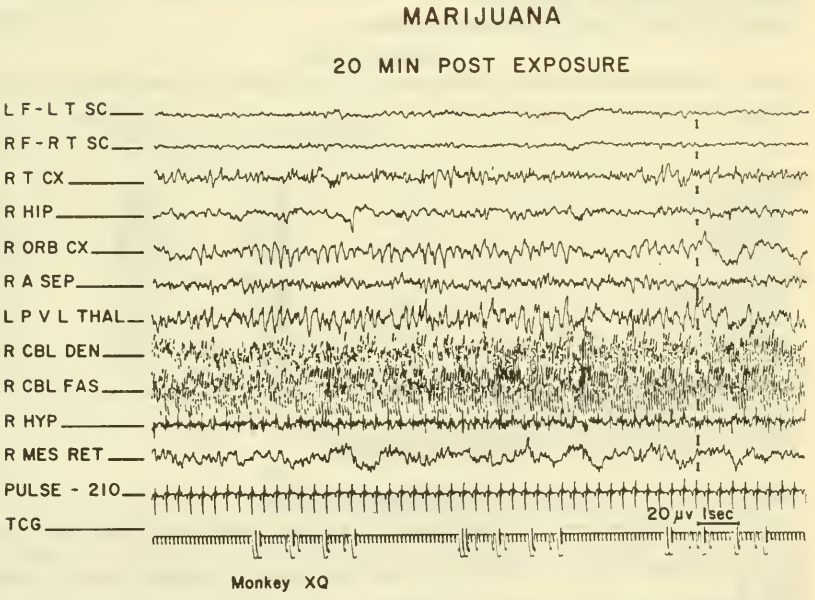

Fig. 10. EEG from Monkey XQ 20 min after exposure to marijuana smoke.

with their appearance in the septal region and sometimes independent of it. Other sites frequently involved were the postero-ventral lateral thalamus, both deep cerebellar nuclei, orbital cortex and hippocampus.

In figures 9 and 10 spindling was constant in the cereballar nuclei when the characteristic slow-wave was most prominent in the postero ventral lateral thalamus and orbital cortex and was less obvious in the septal region and the temporal cortex. Scalp leads, by visual inspection, did not reflect the slow-wave activity present at deep sites. Spindling in cerebellar nuclei of the type shown in Figure 10 occasionally appeared in baseline recordings when the monkeys were relaxed, but was present more often (for a much higher percentage of recording time) after exposure to marijuana smoke. When spindles appeared in recordings from the temporal cortex, they were visible but less apparent in scalp recordings over the temporal region.

Results of the air samples obtained with marijuana smoke and with tobacco smoke are shown in Table 1. Results of the blood–gas analyses are summarized in Table 2. With exposure to smoke of marijuana mixed with oxygen, the partial pressure of oxygen remained above baseline values while partial pressure of carbon dioxide remained below baseline values. The values remained within the normal limits after the smoke inhalation, indicating that there was no hypoxia.

TABLE 1.—MARIJUANA SMOKE* AND TOBACCO SMOKE* AIR SAMPLES

	p†CO_2(mm Hg)	p†O_2(mm Hg)
Marijuana:		
Sample taken inside smoke box‡	11.5	258.1
Room air sample	6.4	146.7
Tobacco:		
Sample taken inside smoke box‡	9.2	162.1
Room air sample	5.2	149.2

*Supplementary oxygen mixed with smoke.
†Partial pressure (of CO_2 or O_2 in mm Hg).
‡Smoke at highest density inside box when sample was taken.

TABLE 2.—MARIJUANA SMOKE* AND TOBACCO SMOKE* 5 MIN EXPOSURE TO EACH BLOOD-GAS ANALYSIS

	p†CO_2(mm Hg)‡	p†O_2(mm Hg)§	pH
Marijuana:			
Before exposure	41.1	106.4	7.419
During exposure	39.5	258.1	7.412
10 min post	29.2	122.3	7.431
30 min post	32.3	121.8	7.429
60 min post	29.0	142.0	7.414
Tobacco:			
Before exposure	30.5	132.4	7.422
During exposure	32.4	162.1	7.450
10 min post	24.1	137.5	7.429
30 min post	35.7	94.0	7.450
60 min post	34.9	94.0	7.470

*Supplementary oxygen mixed with smoke.
†Partial pressure (of CO_2 or O_2 in mm Hg).
‡Normal p CO_2 values in man at sea level=41.0 mm Hg (and below).
§Normal p O_2 values in man at sea level=94.0 mm Hg (and above).

Inert marijuana (0.1% delta-^{9} tetrahydrocannabinol)

Behavioral responses of the monkeys to smoke of inert marijuana were minimal to absent. When the concentration of smoke in the chamber was high, the monkeys showed some irritability but settled down promptly when the smoke cleared.

Pulse rates increased from 10 to 20%.

By visual inspection, EEG changes were absent or limited to slight shifts in the dominant frequency.

Tobacco

No notable changes were observed in behavior of the 6 monkeys as a result of exposure to tobacco smoke.

Pulse rates rose from 10 to 19%.

Visual inspection of recordings indicated the possibility of a slight increase in low-voltage beta activity at a frequency of 18 Hz.

Alcohol

In response to i.v. injections of alcohol, all 6 monkeys retched and one vomited. All displayed rolling of the eyes and fleeting lateral nystagmus, and all showed severely depressed awareness, tending to stare into space and responding less to stimulation. Their behavior in response to the alcohol was in some ways similar to that after exposure to marijuana smoke, but it was also qualitatively different. Like their responses to active marijuana, the monkeys showed reduction in level of awareness, stared blankly into space, and were less responsive to sensory stimuli. Qualitatively, however, impairment was less marked; catatonic features, for example, were less apparent. Behavioral effects gradually subsided within 1–2 hr.

Pulse rates increased 5–20%.

Recording changes in association with the alcohol were insignificant. Visual inspection of the EEGs suggested only that high frequencies (16–20 Hz) persisted longer.

Methamphetamine

More consistent alerting and increased restlessness were the only behavioral changes observable in the monkeys after administration of methamphetamine.

Pulse rates rose from 10 to 35%.

Their EEGs showed more consistent low-voltage fast activity than baseline recordings (Fig. 11). Recordings of two of the monkeys showed intermittent bursts of high-amplitude fast spindles (16–18 Hz), most pronounced in the septal region. This change resembled those seen in the EEGs of some of the monkeys when exposed to the marijuana smoke, but it was present a much shorter time.

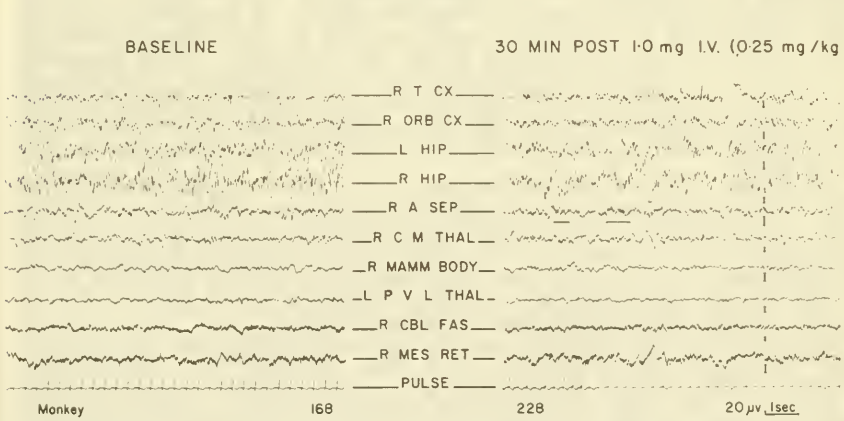

Fig. 11. Baseline EEG and EEG 30 min after intravenous injection of methamphetamine. Sites in the septal region where intermittent minimal spindle bursts occurred are underlined.

Analyses of recordings

The typical results obtained with the EMED device when the monkeys were exposed to marijuana smoke and to tobacco smoke are shown in Table 3. The activity (average absolute amplitude) during a pretest epoch (baseline) is compared with that during the 2 periods after exposure.

TABLE 3.—EFFECT OF MARIJUANA AND OF TOBACCO ON EEG ACTIVITY EMED ANALYSES

Bandwidth	Marijuana		Tobacco	
	Rt. Tem. Cortex	Rt. Ant. Septal	Rt. Tem. Cortex	Rt. Ant. Septal
Delta:				
Baseline mean [1]	0.146	0.101	0.083	0.095
Post mean [1]	.207	.222	.069	.066
Significance level	<1%	<1%	<1%	<1%
Theta:				
Baseline mean [1]	.096	.049	.045	.049
Post mean [1]	.126	.088	.031	.030
Significance level	<1%	<1%	<1%	<1%
Alpha:				
Baseline mean [1]	.083	.020	.021	.026
Post mean [1]	.113	.041	.018	.016
Significance level	<1%	<1%	<1%	<1%

[1] Determined from 10-min of continuous data.

There was a significant increase in activity in each bandwidth and at both the anterior septal region and over the temporal cortex in association with the marijuana smoke. This increased activity did not, however, seem to be specific in location, and it was not confined to a particular frequency band. With exposure to tobacco smoke, the EMED analysis showed a notable decrease in activity at all sites and at all frequencies.

DISCUSSION

The distinct changes recorded from specific subcortical structures of the rhesus monkeys exposed to smoke of marijuana with high THC content lends support to previous reports of studies in lower animals showing changes in brain recordings from deep nuclear masses (Hockman *et al.*, 1971; Boyd and Meritt, 1966; Christensen *et al.*, 1971; Bose *et al.*, 1964). The scalp EEGs of the monkeys only minimally reflected the profound activity occurring at deep sites. This finding corresponds with data obtained from a study of marijuana in a severely ill psychiatric patient in whom deep and surface electrodes were implanted for diagnostic and therapeutic purposes (Heath, 1972a). On the several occasions when the patient smoked a cigarette of marijuana with high THC content from the same batch that was given to the 6 monkeys described here, there was a notable absence of surface EEG changes, by visual inspection, in contrast to the distinct changes recorded from septal leads. These findings agree with previous reports of negligible scalp EEG changes in human subjects in association with smoking of marijuana (Gibbs, 1970; Wikler and Lloyd, 1945; Rodin, Domino and Porzak, 1970; Deliyannakis, Panagopoulos and Huott, 1970).

The extent of involvement of subcortical sites in the monkeys was greater than in the human subject we studied. Other reports indicate that animals lower on the phylogenetic scale than the subhuman primates display even more widespread brain involvement. More diffuse effects on brains of cats and rats with administration of THC were, for example, reported by Hockman *et al.* (1971) and by Christensen *et al.* (1971), suggesting that marijuana asserts a more localized effect as one moves up phylogenetically.

None of the control substances used in this study induced the notable EEGs from subcortical neural sites that have been identified with emotional expression (Heath, 1972b). Since smoke of tobacco and inert marijuana failed to induce marked, focal subcortical recording changes, it is assumed that the EEG alterations seen with active marijuana were a consequence of inhalation of active materials—probably THC—rather than the smoke *per se*. Administration of alcohol and amphetamine, used as control materials because they induce some behavioral changes similar to those seen in association with marijuana, resulted in less dramatic recording changes. Alcohol induced only generalized effects. Amphetamine induced some minimal spindling in septal recordings along with generalized low-amplitude fast activity. These findings suggest that active constituents of marijuana exert a unique effect on activity of brain

cells identified with pleasure feelings (Heath, 1964; Heath and Gallant, 1964; Heath *et al.*, 1968; Heath, 1972c).

The septal region (Heath, 1954a), from which the distinct recording changes consistently occurred in the monkeys after inhalation of smoke of active marijuana, is rostral to the anterior commissure at the base of the anterior horn of the lateral ventricles. As we defined the region, its rostral caudal extent is 6–9 mm rostral to the anterior commissure and its lateral extent is 3 mm from the midline. Dorsoventrally, it extends from the base of the ventricle to the orbital cortex. Principal structures included within this region are the nucleus accumbens septi and the nucleus of the diagonal band of Brocha. Electrodes in the brains of these monkeys from which we recorded the most significant EEG changes were at the stereotaxic AP coordinate of A–25.

Studies in our laboratories during the past 22 years have consistently identified activity of the septal region with pleasure, levels of awareness, and emotional expression (Heath, 1964; Heath and Gallant, 1964; Heath *et al.*, 1968; Heath, 1972c). When function of this region is impaired, level of awareness decreases, ability to experience pleasure is reduced, and emotionality is damaged. Lesions in the septal region of cats and rhesus monkeys, for example, have induced gross impairment in emotional expression and levels of awareness (Heath, 1954b; Heath, 1959). Psychotomimetic chemicals that grossly impair behavior of monkeys, such that it resembles the psychotic state of humans, have induced abnormal spiking and slow-wave activity in the septal region like that recorded from the septal region of psychotic patients (Heath and Mickle, 1960; Heath and deBalbian Verster, 1961; Heath, 1966, Heath, 1970). Further, in a recent study in our laboratories, a consistent finding in the EEGs of isolation-raised monkeys whose behavior was severely disturbed was sharp spiking in the anterior septal leads (Heath, 1972d).

Activation of the septal region, on the other hand, heightens awareness and induces pleasure. Such responses have been elicited with electrical and chemical stimulation of the brains of patients (Heath, 1964; Heath, *et al.*, 1968). Activity of the septal region has been shown to be profoundly affected during pleasurable behavior states (Heath, 1972c).

Other subcortical sites of these rhesus monkeys most often affected by smoke of active marijuana have been shown, by evoked potential studies, to be directly connected to the septal region and to be involved in the phenomenon of emotional expression (Heath, 1972b). Involvement of the sensory relay nuclei (cerebellar nuclei for proprioception and postero ventral lateral thalamus for somatosensory functions) provides a physiological basis for the clinical observation that distoritions of body image and unusual somatic sensations often accompany the mood changes that occur with marijuana smoking.

It may be that the pleasurable feelings associated with marijuana are related to activation of the septal region and other neural sites implicated in emotional expression. As our studies of human subjects have indicated, however, characteristically different recordings have been obtained from these same brain sites during episodes of psychotic behavior. It is provocative that an increasing number of reports indicate that chronic marijuana smoking can induce distinct personality changes and even psychotic behavior (Tinklenberg, Melges, Hollister and Gillespie, 1970; Melges, Tinklenberg, Hollister and Gillespie, 1970; Kolansky and Moore, 1971). Further, pneumoencephalographic evidence suggests that marijuana can cause organic brain change (Campbell, Evans, Thomson and Williams, 1971). Since the data presented in this study correspond with those obtained from a study in a patient prepared with deep and surface electrodes (Heath, 1972a), chronic exposure to marijuana smoke of the rhesus monkey preparation could conceivably shed light on some of these current issues.

Acknowledgements.—The author is grateful to C. J. Fontana, J. P. Wust, Jr. and H. J. Daigle for their technical assistance with the study, and to L. S. Lustick, M.S., who conducted the analyses of the recordings using the Electrophysiological Monitor and Event Detector.

Supported in part by the Behavioral Science Research Foundation, Inc., New Orleans, Louisiana, and the Institute of Mental Hygiene of the City of New Orleans, Louisiana.

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[From Arch Gen Psychiat/Vol. 26, June 1972]

Marihuana—Effects on Deep and Surface Electroencephalograms of Man

(By Robert G. Heath, MD, DMSci, New Orleans)

Effects of marihuana on electroencephalograms and behavior were observed in a patient in whom electrodes had been implanted into numerous predetermined deep nuclear sites and over the surface of the cortex of the brain. On four occasions while the patient was smoking a marihuana cigarette, development of euphoria was associated with the EEG appearance of distinct high-emplitude slow-wave activity (1 to 3 hertz) focal in the septal region. No significant changes were observed in EEGs recorded at other deep sites, over the cortex, or from the scalp. Nor were similar distinct changes observed in EEGs from deep sites of the brain of the same patient when effects of amphetamine, alcohol, and tobacco smoking were studied for comparison with changes induced by marihuana.

Physiologic studies in human subjects to clarify the relation between commonly abused drugs and brain function have thus far relied principally on scalp electroencephalograms. Generalized changes have been recorded in scalp EEGs after use of some drugs, but these nonspecific changes have provided little information about how these drugs affect the brain. Despite the attention given to cannabis (marihuana and hashish) during the past few years, only a few reports have been found of the effects of marihuana smoking on scalp EEGs of human beings. More than 25 years ago, Wikler and Lloyd (*1*) described minimal and inconsistent scalp EEG changes in their study of the effects of marihuana smoking on 19 long-term narcotics addicts. More recently, Rodin and associates, (*2*) in a report on ten medical students who had smoked marihuana for at least a year, found scalp EEGs to be normal in all subjects; nine of the students had smoked marihuana at least once per week and some as often as five to six times per week, and one had smoked it twice per month. During the experiments, all ten students were encouraged to smoke as many marihuana cigarettes as they wished in order to reach a "high." By visual inspection of the EEGs, it was impossible to distinguish the premarihuana from the postmarihuana EEGs, although there was a suggestion of somewhat more persistent alpha rhythm with slower frequency components after smoking, and power density spectral analysis confirmed the impression.

Deliyannakis and associates (*3*) reported minimal and inconsistent EEG findings in a study of 27 soldiers who were admitted hashish addicts. In this study, as well as in others, (*4*) changes in activity in scalp recordings during tobacco smoking, used for comparative purposes, were found to be of essentially the same magnitude. Gibbs (*5*) has also commented on the rather obscure, inconsistent, and seemingly nonspecific effects of marihuana on scalp EEGs.

A few studies conducted in lower animals (dogs, rabbits, cats, rats) give some indication that the active ingredients of marihuana affect brain record-

ings from deep nuclear masses more than surface recordings. (*6–9*) No reports have been found, however, of the effects of marihuana or its known ingredients on the function of deep brain structures of subhuman primates or man.

The present report concerns the effects of marihuana smoking on behavior and EEG recordings from numerous deep brain structures of a patient in whom electrodes were implanted into deep nuclear masses, as well as subdurally over the surface, for diagnostic evaluation and for treatment of a severe psychiatric disorder. Effects of amphetamine, alcohol, and tobacco smoking were also observed for comparison with changes induced by marihuana.

METHOD

History of Patient No. B–19.—The patient, who was 24 years old when these studies were conducted in 1970, had a diagnosis of severe character disorder with chronic depression and a three-year history of drug abuse. He was considered a chronic suicidal risk, repeatedly having remarked, "I live with the idea of suicide daily," and he actually made several abortive suicidal attempts. His chronic depression was characterized by inability to experience pleasure. Ingestion of drugs had offered fleeting relief from his persistent anxiety and depression, and had led to habituation to sedatives and stimulants, as well as to chronic use of marihuana and lysergic acid diethylamide (LSD). All of his relationships (with family members, acquaintances, physicians, and supporting hospital personnel) were characterized by coercion, manipulation, and demand.

The patient's parents are both 55 years of age. His father, an officer in the United States Army, retired when the patient was 18 years old. His one sibling is a 19-year-old sister.

The patient's educational history (marked by repetition of grades and the need for frequent discipline by teachers and principals) was chaotic—beyond that expected by the frequent moves of the family, which included three tours of duty outside the United States. He dropped out of high school after 3½ years and later held a variety of jobs (stock clerk, janitor) for brief periods. One month of military service was terminated by medical discharge because of "homosexual tendencies." For about three years before his hospitalization for the procedures described in this report, he had been a vagrant, experimenting with drugs and engaging in numerous homosexual relationships.

The patient had been a moderately heavy tobacco smoker (averaging two packs per day) since he was 16. He was a "social drinker" of alcohol, but tended to drink excessively when alcohol was readily available.

His experimentation with drugs began when he was 21, with ingestion of vanilla extract. He later became habituated to amphetamines, and used a variety of other sedative and hallucinogenic chemicals (marihuana regularly, nutmeg frequently, and LSD sporadically, as well as inhalants such as glues, paint-thinners, and sedatives). At the time of this study, he was out on bail, having been legally charged with possession of marihuana. He described a variety of behavioral signs and symptoms in association with his use of marihuana before the studies reported here. The marihuana principally affected his mood and emotions, he said; usually he experienced euphoria, which he described as a "rush," of varying intensity. On a few occasions, however, he became depressed when he smoked marihuana, which he described as "very potent," and once he had auditory hallucinations. He felt that both environmental setting and potency of the marihuana affected his behavioral response to it.

Because of his poor adjustment to high school, the patient first saw a psychiatrist when he was 17. He was hospitalized in a state psychiatric institution in August 1968; discharge diagnosis five months later was "depressive reaction." From July through October 1969 he was on the psychiatric service of a Veterans' Administration Hospital, where hospital personnel described him as uncooperative and coercive. His condition at discharge was essentially unchanged. Diagnoses were (1) personality disorder with homosexual behavior and drug experimentation, and (2) temporal lobe dysfunction (based on EEG

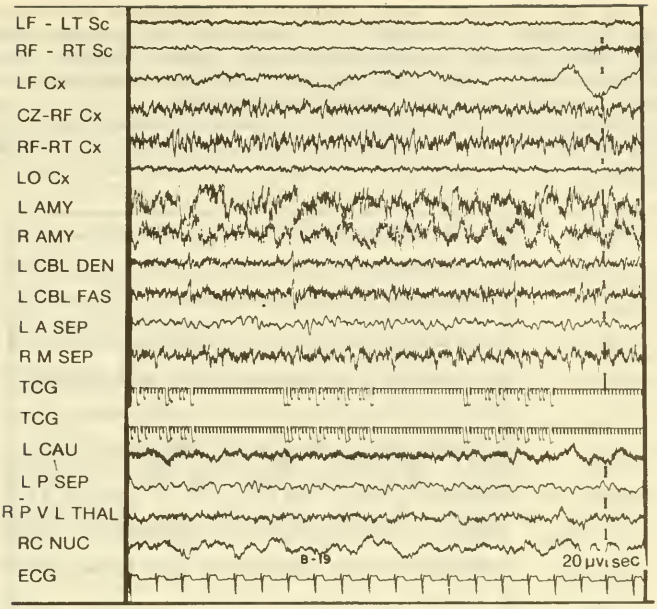

Fig 1.—Typical baseline deep and surface EEGs obtained from patient B-19 during state of relaxation. *LF-LT Sc*, left frontal to left temporal scalp; *RF-RT Sc*, right frontal to right temporal scalp; *LF Cx*, left frontal cortex; *CZ-RF Cx*, central zone to right frontal cortex; *RF-RT Cx*, right frontal to right temporal cortex; *LO Cx*, left occipital cortex; *L AMY*, left amygdala; *R AMY*, right amygdala; *L CBL DEN*, left cerebellum dentate; *L CBL FAS*, left cerebellum fastigius; *LA SEP*, left anterior septal; *RM SEP*, right midseptal; *TCG*, EEG channel used as marker for time-code generator; *L CAU*, left caudate nucleus; *RP V L THAL* or *R VEN LAT THA*, right posterior ventrolateral thalamus; *RC NUC* or *R CEN NUC THA*, right central nucleus of the thalamus; *RA HYP*, right anterior hypothalamus; *R HIP*, right hippocampus; *ECG*, EEG channel indicating pulse rate.

findings). The patient's hospitalization for the studies described here began 5 months before the elective brain surgery.

Preoperative Examinations.—Results of physical and neurologic examinations were within normal limits, as were the results of urinalyses and blood chemical analyses.

Some of his preoperative conventional scalp EEGs showed abnormal bilateral temporal slow-wave activity maximal on the left. Chlorolose activation caused paroxysmal delta activity to appear over the right temporal region, and this was further exaggerated by hyperventilation.

The following psychologic tests were administered: Aphasia Screening Test, Benton Visual Retention Test, Bender Visual Motor Gestalt, Bender Recall, Porteus Maze Test, Trailmaking Test, Wechsler Memory Scale, Graham Kendall Memory for Designs, Formboard, Finger tapping, Ballistic tapping, Dynamometer, Grooved Pegboard, and Wechsler Adult Intelligence Scale (WAIS). Briefly summarized, the tests indicated the patient was in the bright normal range of adult intelligence, with verbal skills superior to perceptual motor skills. The testing session was long and arduous since the patient was inordinately compulsive and spent a great deal of time complaining and criti-

cizing. Verbal and nonverbal recall under both immediate and delayed conditions was excellent. The ability to concentrate and to plan ahead was unimpaired, and he had no problem with impulse control. Overall, his performance was exceptionally rigid, perfectionistic, and time-consuming, and was accompanied by complaining and a negativistic attitude.

Electrode Placements.—The operative procedure was carried out with use of a general anesthetic and with visualization of the ventricular system by air and ethyl iodophenylundecylate. By techniques previously described, (*10*) elec-

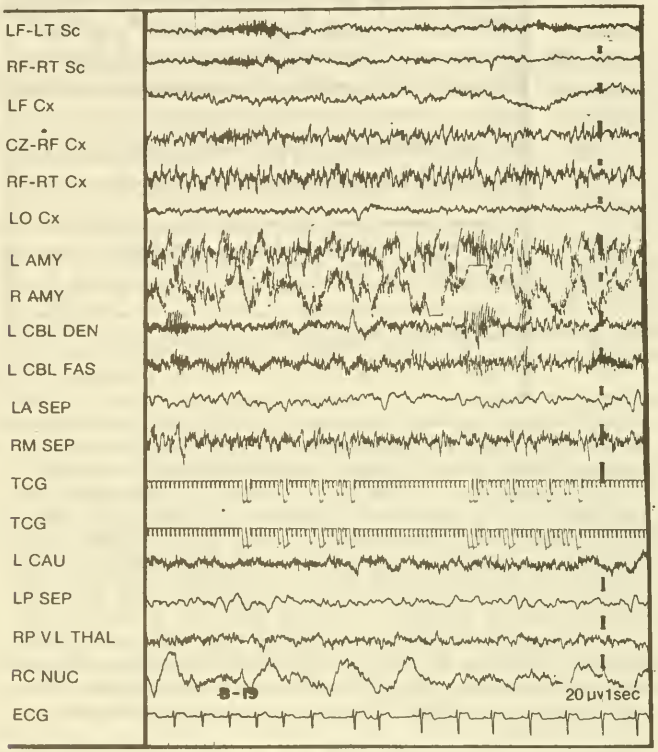

Fig 2.—Typical baseline deep and surface EEGs obtained from patient B-19 during state of alertness. (See Fig 1 for explanation of abbreviations.)

trodes were stereotaxically implanted into a variety of deep sites and over the cortex of the brain. Stainless steel Teflon-insulated electrodes, 0.003 inch in diameter, each with three to six leads separated by 0.08 inch, were implanted into the right midseptal region, (*11*) right hippocampus, left and right amygdalae, right anterior hypothalamus, right posterior ventrolateral thalamus, and left caudate nucleus, as well as at two subcortical sites within the left lobe of the cerebellum. (The electrodes were intended for the fastigius and dentate nuclei and are so labeled on the recordings shown in the figures. Final roentgenograms, however, revealed them to be in the cerebellar cortex and subcortical white matter.) Cortical leads were placed under the dura at sites in the left and right frontal regions, left and right parietal regions, and right temporal region. Triple-lead silver ball (*12*) polyvinyl chloride-insulated electrodes were implanted into the left anterior and left posterior septal region. The silver ball contact points were 0.02 inch in diameter, each 0.08 inch apart.

Intracerebral cannulas (*13*) (used for studies to be described in another report) were implanted into the septal region bilaterally (about 0.08 inch rostral to the anterior commussure on the left and at the level of the anterior commissure on the right) and into the hippocampus.

By three weeks after operation, EEGs from the various brain sites had stabilized, that is, all artifacts due to anesthesia and brain trauma incurred at operation had disappeared.

Recording Procedures.—Recordings were obtained on two electroencephalographs, one 12-channel and one 8-channel (Grass Model VI). The two machines were synchronized by use of a time-code generator. (One channel recorded the pulse rate.)

Samples of significant recordings were simultaneously recorded on magnetic tape through use of a 7-channel recorder (Ampex FR 1300). The EEGs and the magnetic tape recordings were synchronized with an EECO (Electronics Engineering Co. of California) 858–A time-code generator/reader with one EEG channel used as a marker for the generator. Samples of baseline data and of activity obtained at intervals when various materials were being tested were analyzed to determine brain activity in the canonical delta-, theta-, and alpha-band widths. The measure of activity was the average of the absolute amplitude. For this analysis an Electrophysiological Monitor and Event Detector (EMED) was used which integrates energy at predetermined frequencies. The average activity at four sites, three subcortical (left anterior septal region, right midseptal region, and left amygdala) and one cortical (frontal cortex), was obtained and evaluations were made of differences before and after use of the various materials. Split-screen audiovisual tapes were made showing the patient's behavior and EEGs just before smoking marihuana, while smoking it, and later.

Test Materials and Mode of Administration.—Marihuana.—Marihuana was obtained by court order from Federal narcotics agents. For smoking by the patient, 1.5 gm of marihuana was rolled into a cigarette paper. On each of the four occasions when the patient smoked marihuana for this study, only one cigarette was used; in each instance, about 0.25 gm of marihuana remained in the unfinished portion of the cigarette so the patient had 1.25 gm. Assay by gas chromatography of the marihuana indicated the content of tetrahydrocannabinol was 2.29% or 28.62 mg.

The patient inhaled deeply with each puff, and both physiologic and psychologic effects appeared before he had finished smoking the cigarette. He was instructed to push a button when he experienced a "rush" in response to the marihuana; this button automatically marked the EEG.

Tobacco.—For the tobacco study, the patient smoked one cigarette of a popular brand, inhaling deeply with each puff, while the EEG recording was obtained.

Alcohol.—The patient drank 6 oz of 90-proof bourbon mixed with 6 oz of water for this study.

Amphetamine.—A dose of 15 mg of methamphetamine was injected intravenously.

In all instances, EEG recordings were obtained before the test material was given, during its administration, and at regular intervals thereafter as long as behavioral or physiologic effects persisted.

RESULTS

Postoperative, Premarihuana Behavior and Recordings.—During a six-week period after the patient had recovered from all effects of the electrode implantation and before the studies described here were begun, recordings lasting at least one hour were obtained five days each week. These extensive baseline EEGs were obtained during a wide range of levels of awareness, from deep sleep to alert wakefulness, and during profoundly fluctuating psychologic states. His behavior during this period included short episodes of overt psychosis, episodes of irrational rage and fear, and a variety of mood swings. For several consecutive days, he would report he was feeling good, and his behavior, as evaluated by his physician and ward personnel, was normal.

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Typical deep and surface EEGs obtained during such periods of alertness and relaxation are shown in Figs. 1 and 2.

During brief episodes of psychotic behavior after electrode implantation but before the studies described here, his recordings showed spike and slow-wave activity from the anterior septal lead, a consistent finding in all patients in our depth electrode series during psychotic periods. (*10, 14, 15*) (Since 1950, 60 patients have been studied by depth electrode techniques in the Tulane laboratories.)

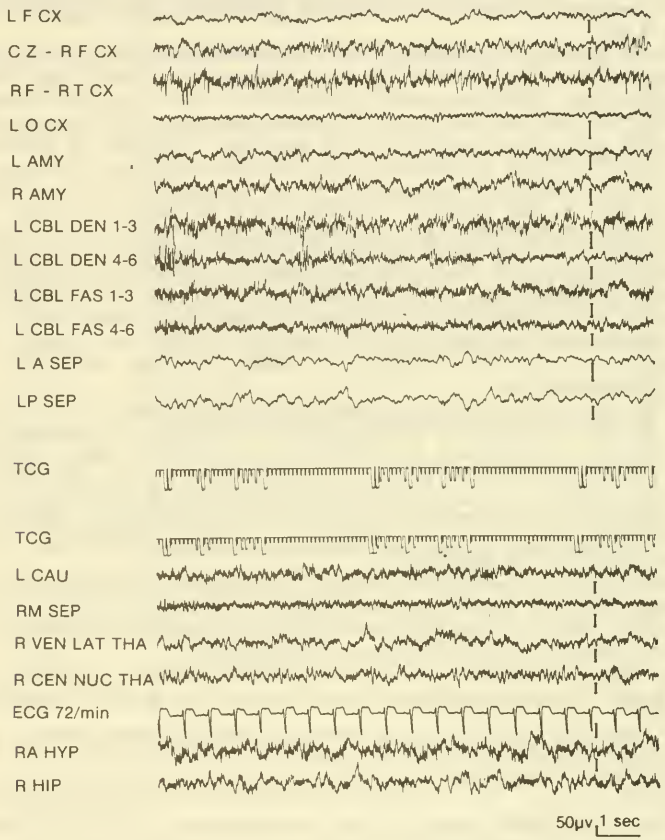


Fig 3.—Baseline deep and surface EEGs obtained from patient B-19 just before smoking a marihuana cigarette. (See Fig 1 for explanation of abbreviations.)

Results of psychologic testing after electrode implantation and before the studies reported here were unchanged from those of the preoperative testing.

Marihuana.—Behavior and Results of Psychologic Testing.—The patient never displayed psychotic signs and symptoms on the four occasions when he smoked marihuana. His behavioral responses were those reported most consistently with marihuana smoking. (*16–19*) On each occasion, mood changes began within three to five minutes after his first deep inhalation of smoke. Intermittent peaks of euphoria developed, coming in waves of 30 seconds to one minute, inter-

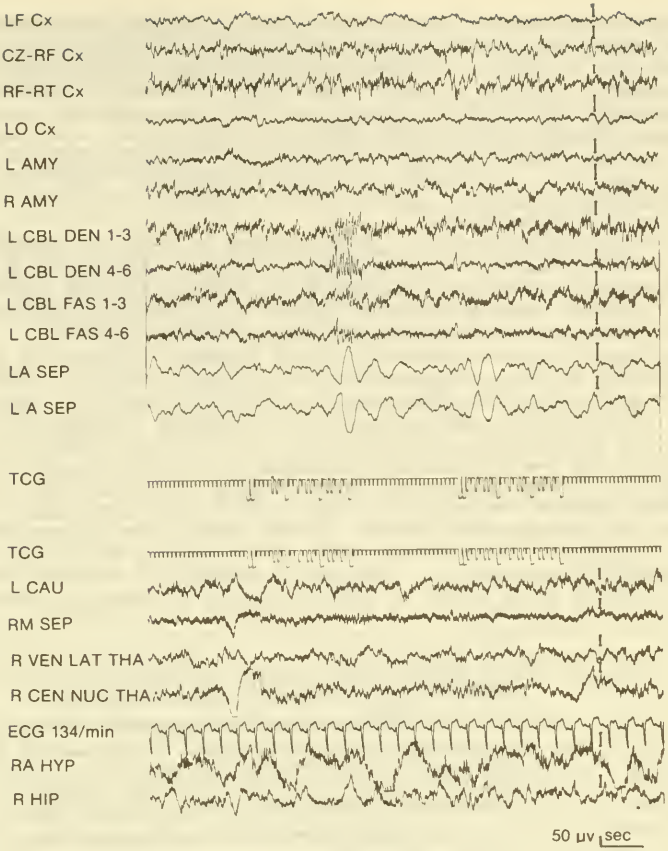


Fig 4.—Deep and surface EEGs obtained from patient B-19 15 minutes after smoking a marihuana cigarette. (See Fig 1 for explanation of abbreviations.)

spersed with plateaus of 30 seconds to two minutes when mood remained elevated significantly over baseline. The waves of euphoria were similar to those he had described as having experienced in the past with marihuana smoking. During these "rushes," he smiled broadly, sometimes giggled audibly, and testified, using various descriptive adjectives, to the pleasure of the experience. Objective manifestations of the drug effects were silliness, flight of ideas, and obviously shortened attention span, with varying degrees of impairment of thinking.

On one occasion when he smoked marihuana and showed clearcut behavioral effects, he was given most of the psychologic tests that had been used before and after electrode implantation to establish a psychologic baseline. Tests showed that in association with marihuana, he was more cordial, pleasant, gregarious, and generally cooperative than during baseline testing sessions. Recall, both immediate and delayed, was superior for verbal and nonverbal material; maintaining his attention, however, was more difficult. Planning and foresight for the outcome of purposeful action sequences were notably poorer than on previous evaluation (118 versus 135) and reflected less concern over

the results of his behavior. There was no sign of disregard for instruction or direction nor of poor impulse control. Rather, he tended to take the test with more ease than on any previous occasion and spent less energy planning ahead.

Dynamometric strength of hands was mildly depressed bilaterally. Gross motor movement was excellent, although relatively slower with the nonpreferred (left) hand. Similar results were found on finger-tapping, being bilaterally within expected limits but slightly slowed with the left hand. He showed adequate fine motor coordination and manual dexterity. There were no apparent sensorimotor deficits, results of these measures not differing significantly from earlier evaluations.

Intellectually, he exhibited no notable changes in perceptual motor ability, such as construction of three-dimensional geometric designs, or perception and synthesis of part-whole relationships. On verbal tasks, his concentration was only average, that is, somewhat poorer than previously, and his arithmetic calculation was deficient and lower than previously measured.

Graphic reproduction of relatively simple geometric figures was good, although lacking in the obsessive-compulsive accuracy which he had demonstrated on previous testing. Originally, he required 37 minutes to complete the drawing of eight figures, erasing repeatedly and seeking exaggerated precision. Whereas his premarihuana drawings were flawless and perfectly organized on the page, they were consistently expansive and drawn with great pressure on the pencil. During the postmarihuana testing, the entire task took only 5½ minutes, showed fewer erasures, and was notably less precise and less expansive. His drawings had a sketchy quality which he would previously have refused to produce or allow as acceptable. These findings recurred on another test requiring the reproduction of designs by drawing. All drawings were well done and showed fewer effects of a rigid and perfectionistic approach to the tests.

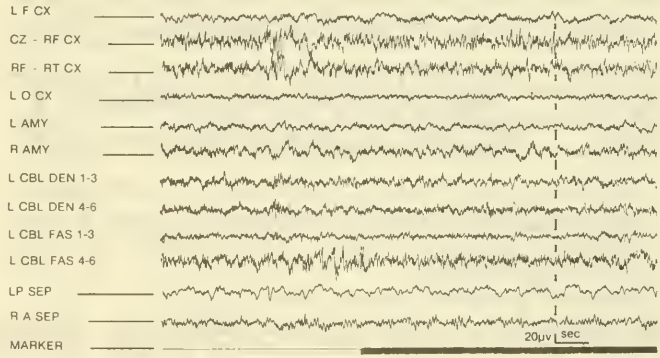


Fig 5.—Deep and surface EEGs obtained from patient B-19 when testing the automatic marker he himself used to signal "rushes" in response to smoking marihuana. This procedure controlled for such artifacts as movement. (See Fig 1 for explanation of abbreviations.)

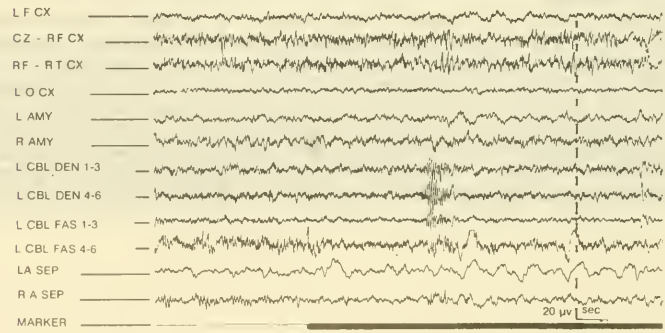
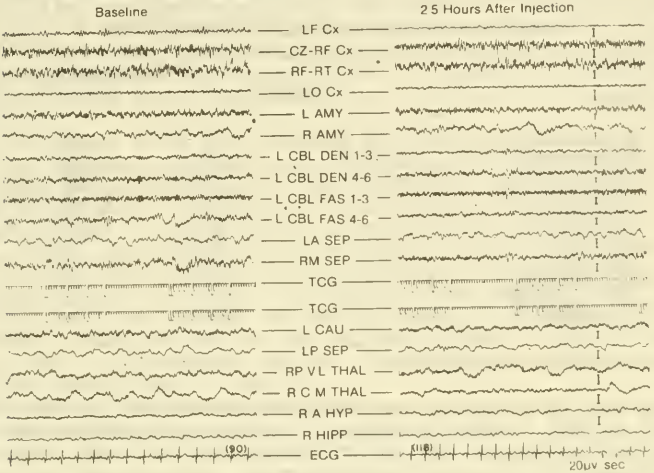


Fig 6.—Deep and surface EEGs obtained from patient B-19 when he signaled a "rush." (See Fig 1 for explanation of abbreviations.)

Fig 7.—Deep and surface EEGs obtained from patient B-19 when he was given 15 mg of methamphetamine intravenously. (See Fig 1 for explanation of abbreviations.)



He was generally more cooperative and at ease than on any other testing occasion; he was able to accept less than perfect performance and complained very little about difficulties with the tasks at hand. There was no evidence of the remarkable compulsivity which he had demonstrated consistently in the past.

Electroencephalograms.—Typical premarihuana recordings were like those shown in Figs. 1 and 2. With onset of his behavioral response to marihuana, within three to five minutes after the first deep inhalation of smoke, high-voltage slow-wave activity (frequencies were predominantly 1 to 3 Hz) appeared focally in the septal leads (Figs. 3 and 4). The electrical activity was correlated with the patient's behavioral responses, changes being more pronounced when mood elevation was greatest. The septal abnormality was most prominent and synchronous when he reported "rushes." No significant changes in other deep or surface leads were ever seen with marihuana in this patient. He accurately signaled the "rush" when the marihuana initially affected him; the marks on the recordings made by the automatic signal coincided with the appearance of EEG changes (Figs. 5 and 6). As behavioral signs and symptoms (flightiness, distraction) became more pronounced, however, his attention was impaired to such a degree that he no longer signaled the "rushes." When the patient failed to use the signal during characteristic behavior such as silly grimaces or giggling occurring with the synchronous high bursts of delta activity, his response to inquiries was that he just "felt too good to bother about it." His pulse rate, as indicated on the recordings, was strikingly higher during the "rushes."

On each of the four occasions when he smoked marihuana for these studies, the strong, intermittent "rushes" of intense euphoria, including the interspersed plateaus of mood elevation, lasted for 45 minutes to one hour. Although the "rushes" then subsided, the patient's well-being persisted to a slowly diminishing degree for about two hours. When the "rushes" subsided, the high-amplitude 1 to 3 Hz activity in the septal leads disappeared and was replaced by more rhythmical, lower amplitude 5 to 7 Hz activity also focal in the septal leads.

Tobacco.—No behavioral changes were observed as a result of tobacco smoke, and the patient's pulse rate did not rise.

His EEGs while smoking tobacco were like his baseline EEGs during states of alertness (Fig. 2) except that low-voltage fast activity was more prevalent.

Alcohol.—Although the patient became more euphoric and more talkative (obviously a little "high") after his drink, changes in recordings were insig-

nificant, nothing occurring that was outside the range of fluctuations in baseline EEGs. During the hour after consumption of alcohol, recordings resembled his baseline EEGs during relaxation (Fig. 1); slower, slightly high-amplitude activity occurred for longer periods. The patient's pulse rate did not change.

EFFECT OF MARIHUANA ON EEG ACTIVITY (PATIENT B–19)

Bandwidth	Region	Baseline mean[1]	Post-marihuana mean	Significance
Delta	Left anterior septal	0.15	0.20	< 1%
	Right midseptal	.09	.12	< 1%
	Left frontal cortex	.07	.08	
	Left amygdala	.11	.11	
Theta	Left anterior septal	.08	.08	
	Right midseptal	.07	.07	
	Left frontal cortex	.06	.06	
	Left amygdala	.07	.06	
Alpha	Left anterior septal	.04	.04	
	Right midseptal	.10	.06	< 1%
	Left frontal cortex	.04	.04	
	Left amygdala	.04	.04	

[1] Determined from ten minutes of continuous data.

Amphetamine.—The patient responded characteristically to the methamphetamine; he said he felt "quite good." He appeared euphoric and became garrulous, and his mental activity was accelerated. Although there was an increase in pulse rate, it was significantly less than the rise that occurred with marihuana smoking.

Changes in EEG recordings were minimal; there was more consistent low-voltage fast activity with some reduction of higher voltage slow frequencies (Fig. 7). No focal changes were noted.

EMED Analyses.—Results obtained with the EMED device when the patient was under the influence of marihuana are summarized in the Table. The activity (average absolute amplitude) during a predrug epoch (baseline) is compared with that during a postdrug period. Of the sites analyzed, only the left anterior septal region and right midseptal region showed significant changes. A significant increase in delta activity was observed at both sites, and a significant decrease in alpha activity was noted in the right midseptal region.

COMMENT

Patient No. B–19, in whom electrodes were implanted into many subcortical sites for long-term diagnostic studies and treatment, provided an unusual opportunity to study the effects of marihuana smoking on brain function. Scalp recordings obtained from this patient showed minimal or no changes, a finding consistent with other published reports. (*1–3, 5*) On the other hand, consistent changes occurred in deep recordings from the septal region (*11*) concomitant with the well-known and often described behavioral effects of smoking marihuana. These recordings differed significantly from those obtained with tobacco smoking or with use of alcohol or amphetamine; the changes were distinct, whereas the changes in deep recordings with the other materials were minimal or absent. Of the changes in scalp recordings in association with tobacco smoking reported in the literature, the most consistent is a shift towards a higher alpha frequency in some subjects (*20–22*); changes are more profound under special circumstances—for example, when a heavy smoker smokes a cigarette after being deprived of tobacco for a significant period of time. (*23*) Some of the behavioral effects induced in patient No. B–19 by smoking marihuana were like those induced by alcohol or amphetamine while others have not been observed in association with alcohol or amphetamine.

When this study was conducted in early 1970, we were unaware of a method for determining the exact dosage of marihuana which the patient was absorbing as he smoked a marihuana cigarette. Nor could we be certain that the quantity of tetrahydrocannabinol represented all the active material in the marihuana. We were, therefore, unable to give exact dosages. The pro-

cedure by Renault and associates, (*24*) using heart rate to demonstrate dose response, was published after the studies presented here were completed and after electrodes had been removed from the brain of patient No. B–19. The maximum dose used by Renault and associates was 435 mg of marihuana containing 1.5% tetrahydrocannabinol. The maximum heart rate response of their patient on the highest dose of marihuana was 75%. The consistent increase of 70% to 90% in the heart rate of patient No. B–19, while smoking marihuana on the four tests, suggested that the quantity of active ingredients he absorbed from our potent preparation (as determined by assay) was significant.

Until the present study, investigations of marihuana effects in man focused largely on behavioral responses, both subjective and objective, and on changes in peripheral physiologic measurements. Brain physiology studies were limited to scalp EEGs, which were obtained by a technique too insensitive to show significant changes in brain activity. Because studies of marihuana in lower animals (*6–9*) lacked essential behavioral data, which are dependent on subjective reporting of changes in feelings and thoughts, interpretation of brain physiologic changes was highly speculative. Establishment of a clear and consistent correlation between subjective reports of behavioral changes and alterations in brain function of this patient provides a link for conducting more extensive and meaningful studies of the effects of marihuana and other euphoria-producing drugs in animals.

Some subcortical studies of animals have previously been reported to be affected by administration of delta^1-tetrahydrocannabinol (THC). Christensen and associates (*8*) reported considerable delta activity and fast high-amplitude spindles from the amygdala, ventromedial hypothalamus, hippocampus, and a number of cortical regions after THC was given to rats. In our own studies of rhesus monkeys, those which were exposed to marihuana smoke containing significant levels of THC consistently showed a notable change in recordings from the septal leads. (*25*) On occasion this region alone was affected, but usually other sites showed changes as well. When only the septal region was affected, a delta wave at a frequency of 2 to 4 Hz characteristically appeared, resembling the EEGs obtained from patient No. B–19 when he smoked marihuana.

On other occasions, EEGs of the monkeys showed additional changes. Sometimes the slow wave in recordings from the septal region was accompanied by a similar wave (frequency of 2 to 4 Hz) recorded from the mesencephalic reticulum and the posterior ventrolateral thalamus, while no significant changes appeared in recordings from other deep structures or from the surface. Another frequently occurring recording change was the appearance of bursts of high-amplitude spindles (approximating 16 Hz), most pronounced in the septal leads and occasionally present in other deep leads and over the temporal cortex. The presence of spindles at other sites was sometimes synchronous with their appearance in the septal region and sometimes independent of it. Other often involved sites were the posterior ventrolateral thalamus, both deep cerebellar nuclei, orbital cortex, and hippocampus. When marihuana without active ingredients was used in the monkey for comparison, EEG changes did not occur.

Our findings in the patient, as well as in rhesus monkeys, suggest that marihuana asserts a more localized effect as the species moves up phylogenetically.

All these studies suggest that those sites identified as integral components within pathways for expression of emotion and feeling are the most profoundly affected. (*26*) The present study indicates that the nuclear sites principally affected are the ones that have been correlated with the pleasure response. The affected septal region, the site we defined in 1952, (*11*) is in the vicinity of the nucleus accumbens at the base of the anterior horn of the lateral ventricle rostral to the anterior commissure (15 mm in man and 7 to 8 mm in the rhesus monkey).

Beginning with our first report, in 1952, (*27*) of 26 patients prepared with deep and surface electrodes, we have demonstrated a relationship between physiologic activity of the septal region and the behavioral phenomena of pleasure feelings and levels of awareness in man. These studies have involved a variety of procedures in which pleasure responses have been elicited with

electrical and chemical stimulations to the septal region. (*15, 28–30*) Specific EEG changes, most consistently high-amplitude spindling in the septal region, have correlated with subjective reports of pleasure—the most profound EEG changes (and concomitant pleasure response) having been recorded during orgasm. (*31*) In contrast, impaired activity of the septal region, in the form of epileptiform activity, has been correlated with dysphoria, aberrant emotional expression, and reduced awareness, (*14, 15, 27, 32, 33*) and destructive lesions of the septal regions of animals have reduced awareness and impaired emotional expression. (*34*)

Electrical stimulation of the septal region of patients has relieved intractable physical pain (*27*) and administration of some narcotics has resulted in activation of recordings from the septal region. (*28*) Marihuana has also been reported to alleviate physical pain. Evoked potential studies have demonstrated a direct functional relationship between the septal region, where activity is correlated with pleasure, and the relay nuclei for several sensory modalities. (*26, 35*) These connections could offer a physiologic basis for the analgesic effects of the drugs as well as of electrical stimulation of the septal region. This relationship between pleasure sites and sensory nuclei likewise provides a physiologic explanation for the consistent clinical observations that severe disruptive behavior is associated with perceptual disturbances and that impaired perception, in turn, can induce disruptive behavior.

The altered activity recorded from the septal region and occasionally from interconnected sites in association with marihuana is provocative, suggesting that cells of the septal region are affected. As indicated earlier, stimulation of these cells in a variety of ways has induced intense pleasure along with heightened levels of awareness. This effect, by itself, is potentially therapeutic. When activity of the septal region is impaired, however, deleterious behavioral signs and symptoms occur, in the form of reduced motivation and anhedonia (deficient pleasure), often accompanied by perceptive defects and thought disturbances characteristic of reduced awareness. (*10, 27–31*) Although the physiologic effects induced in the septal region with smoking of marihuana were consistent on four occasions in this particular patient, we found, in association with a mixture of behavioral effects, considerable variation in EEGs of rhesus monkeys which had been repeatedly exposed to marihuana smoke. (*25*) When these EEGs showed spiking, in contrast to spindling or delta activity of the type recorded from patient No. B–19, the monkeys were catatonic.

An unsettled issue is whether or not smoking marihuana can induce psychotic behavior. Some investigators have reported that it can induce transient or even chronic symptoms of psychosis. (*36, 37*) whereas others have denied this claim. In the present study and related studies in rhesus monkeys. (*25*) smoking of marihuana altered activity in the septal region (and occasionally interconnected deep sites) from which a distinct type of pathologic activity, in the form of spikes and slow-waves, has been consistently recorded in a large number of patients during periods of psychotic behavior. (*14, 15, 27, 30, 32, 33*) Long-term studies now under way in our laboratories with monkeys will, it is hoped, shed additional light on this issue.

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Commentary on Dosages Used in Studies of Marihuana in Rhesus Monkeys

[Submitted by Professor Robert G. Heath, M.D.]

Some questions have been raised—particularly in regard to quantity of delta–9 THC consumed—concerning the relationship between Tulane studies of marihuana smoking in monkeys and the smoking of marihuana or hashish by human subjects. To answer these questions, we compared intake of delta–9 THC by the monkeys in the Tulane experiment with that of man, basing dosage in man and methods for comparing monkeys with man on information existing in the scientific literature.

According to Freireich and associates,[1] comparisons of dose levels among different species should be based upon body surface area per kilogram of body weight. Using this formula, the dose of delta–9 THC for the monkey would be three times that for man per unit of weight. Stadnicki and associates,[2] following Freireich's formula, based the amount of delta–9 THC given to rats at seven times the human dose to achieve amounts equivalent to those received by human hashish smokers.

Attached is a chart of dose comparisons, based on Freireich's comparison factor for delta–9 THC, between hashish or marihuana smoking in man and marihuana smoking in monkeys used in the Tulane experiment. Human subjects are divided into two groups, heavy hashish smokers [3] and moderate marihuana smokers, and the monkeys into two groups, heavy and moderate marihuana smokers.

Investigators in this field would generally agree with two assumptions on which we have established dose comparisons between monkey and man:

(1) With smoking, there is a 50% loss of delta–9 THC by pyrolysis, and

(2) An additional 20% loss occurs through lung absorption.

In our calculations (attached), we considered man's average body weight to be 75 kilograms. Average body weight of the Tulane rhesus monkeys exposed to heavy smoking was 4 kilograms; of those exposed to moderate smoking, average body weight was 5 kilograms.

The marihuana used in the Tulane study contained 3% delta–9 THC. The marihuana smoked by human subjects is estimated to contain 1%, 1.5% and 2% delta–9 THC because this is the range of potency for marihuana generally available. (Please see Chart.)

Summarizing, the dosage for our heavily smoked monkeys was significantly less than the quantity of delta–9 THC ingested by heavy hashish smokers. Further, the quantity of delta–9 THC ingested by the monkeys per month was slightly greater than that consumed by man smoking one 2% marihuana cigarette per day. Since the monkeys which were moderately smoked were exposed only

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twice a week, the dosage of active ingredient per smoking was considerably higher than for man's smoking.

ROBERT G. HEATH, M.D.

Chart attached.

COMPARISON BETWEEN MAN AND MONKEY

HEAVY SMOKING

Man—Hashish

50 to 600 gm/month (3) : an average of 300 gm/month was chosen.
5% delta-9 THC=80 mg delta-9 THC/kg/month.

Monkey—Marihuana

53.7 mg delta-9 THC/kg/month.

MODERATE SMOKING—ONE 1.5 G CIGARETTE PER DAY FOR 30 DAYS EQUALS 45 GRAMS PER MONTH
[In milligrams]

Percent delta-9 THC per cigarette	Quantity delta-9 THC (milligrams)	Intake delta-9 THC per-month (milligrams)
Man—Marihuana:		
2.0	[1] 0.16	4.8
1.5	[1] .12	3.6
1.0	[1] .08	2.4
Monkey—Marihuana: 3	[2] .64	5.5

[1] Per cigarette.
[2] Per smoking.

[From the Lancet, Dec. 4, 1971]

CEREBRAL ATROPHY IN YOUNG CANNABIS SMOKERS

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SUMMARY

Evidence of cerebral atrophy was demonstrated by air encephalography in 10 patients with histories of consistent cannabis smoking over a period of 3–11 years. The average age of the patients was 22 years; all were males. Amphetamines and lysergide (L.S.D.) had also been taken, but in much smaller amounts. Measurements of the lateral and third ventricles were significantly different from those in thirteen controls of a similar age-group.

INTRODUCTION

Personality changes and mental illness have been reported in chronic cannabis smokers of previously normal personality. (*1*) Addicts often have impairment of recent memory, (*2*) vegetative symptoms, and a tendency to reversed sleep rhythm suggesting organic brain damage. If organic brain damage were confirmed, this would clearly lead to a different approach to the problem of increasing drug abuse.

This study was prompted by the finding of cerebral atrophy on air encephalography in four young patients referred to one of us (A. M. G. C.) for neurological investigation of headache, memory loss, or behavior change. A common factor in all four histories was prolonged heavy cannabis smoking. Amphetamines and lysergide (L.S.D.) had also been taken, but in very much smaller amounts. Since no recognized cause of the cerebral atrophy was apparent, neurological and radiological investigation of other cannabis smokers seemed indicated.

PATIENTS AND METHODS

Patients

The first four cases were unselected routine admissions for investigation of neurological symptoms. The next five were under treatment by one of us (M. E.) for drug abuse, and were referred for detailed investigations of cerebral function, including air encephalography. They were selected because of known long-standing cannabis smoking; two had been attending a drug-addiction center for some time and the other three were the next cases which presented to psychiatric outpatients with histories of longstanding cannabis smoking. The tenth patient was admitted as an emergency with a drug overdose and had a 6-year history of drug abuse with heavy cannabis intake. All these cases were given a full clinical examination and were investigated by air encephalography.

It was fully explained to the patients that the test was to assess possible brain damage with a view to ultimate prognosis, and our patients willingly consented to this investigation, which was done under local anesthesia and sedation.

Controls

One of the main difficulties in estimating the size of the cerebral ventricles by air encephalography is the choice of controls. Most published series include patients of all ages; however, the ventricles enlarge with age. (*3*) The mean age of our patients was 22 years. To obtain normal values for the age range 15–25 years we reviewed the X-ray films and notes of all cases investigated by air encephalography in our neuroradiological unit in which the findings had been reported at the time as normal. We excluded all those with abnormal neurological signs, a raised cerebrospinalfluid (C.S.F.) protein, or other abnormal features. In this way we obtained thirteen controls; their case-notes indicated that these had originally been referred because of symptoms such as headache, loss of consciousness, or syncope. Subsequent follow-up on all of these patients had not revealed the development of any neurological illness. A typical control air encephalogram is shown in fig. 1. Particular attention should be paid to the shape of the lateral ventricles anteriorly, especially the sharpness of the lateral and inferior angles and the upward and inward curve of the floor of the body and the posterior part of the frontal horns.

Of the thirteen controls, seven were female and six male. The series of ten drug-taking patients were all male. However, air encephalograms on the female controls were not significantly different from those of the male controls.

Radiology

The standard air-encephalography technique was used in all cases. About 25 ml. of air was injected into the lumbar subarachnoid space with the patient in the sitting position, under basal sedation. Just enough cerebrospinal fluid for routine laboratory testing was removed. Films of the patient's head were taken in this position, and again with the patient supine and prone. Routine views of the temporal horns were also taken. Measurements of the anterior ends of the lateral ventricles were taken from films obtained in the anteroposterior position with the patient supine. Measurements of the lateral ventricular size were carried out using three standard diameters, and an accurate area measurement was also obtained by using a planimeter, an instrument that mechanically integrates a trace of the perimeter of an object into the area of the object. (*3*) These measurements are illustrated in fig. 2:

"A" is the widest transverse diameter of the frontal horn.

"B" is the oblique diameter from the lateral angle to the junction of the floor of the body of the lateral ventricle with the medial wall.

"C", a line at right angles to B, 5 mm. from its lateral extremity, gives a measure of the lateral angle of the ventricle.

"D" is the transverse diameter of the third ventricle, the posterior width being taken from the film with the patient sitting up, and the anterior width from the film with the patient supine.

"E" is the area of the shadow of the posterior part of the frontal horn of the lateral ventricle (indicated in fig. 2 by the shaded area, and shown in fig. 3 for all cases).

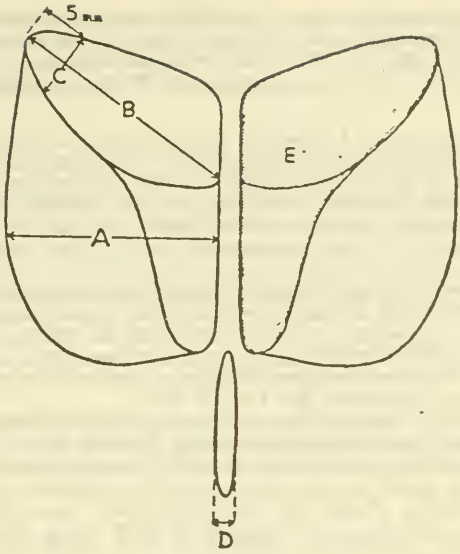

Fig. 2—Measurements used in assessing ventricular size (see text).
Areas in sq.cm. shown in table.

Other Investigations

C.S.F. obtained at air encephalography was examined under the microscope and analyzed for protein. Wassermann reaction, and Lange curve. The C.S.F. pressure was normal in all cases. Skull and chest X-rays were taken in all cases. Venous blood was tested for hemoglobin, leucocyte-count, erythrocyte-sedimentation rate, urea, electrolytes, and liver function. Results were normal except as stated in cases 1 and 9.

CASE-REPORTS

Case 1

An unemployed steel erector, aged 22, complained of generalized headache over recent months. He had had a probable epileptic fit at age 13 but had not been investigated or treated. It was not known whether he had suffered any birth injury, and there was no family history of epilepsy. At age 18 he was in hospital for 3 days because of a head injury. Three weeks later he had a grand-mal epileptic attack, with four similar attacks in the next year. The head injury would seem to have exacerbated preexisting epilepsy.

He had smoked cannabis regularly and frequently since the age of 16. L.S.D. had been taken about twenty times, but he did not admit to taking amphetamine.

On examination he seemed restless, anxious, suspicious, irritable, and despondent. There were no abnormal neurological signs.

Electroencephalography was outside normal limits, displaying minimal epileptic features in all areas. There were no focal abnormalities.

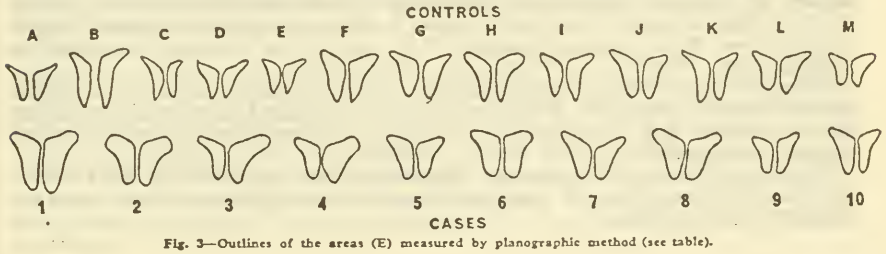

Fig. 3—Outlines of the areas (E) measured by planographic method (see table).

At air encephalography diameters A and B were within the normal range, but diameters C were increased and the back ends of the lateral ventricles were somewhat "square" (fig. 4). The third ventricle diameter D was towards the upper limit of normal. The area measurement E was increased on both sides.

Case 2

An 18-year-old unemployed salesman was admitted for investigation of change in behavior and impairment of recent memory. He said he was becoming increasingly aggressive and could not understand his own behavior. There had been frequent generalized headache over the previous month. He was an adopted son and his own family history was unknown. At the age of 1 year he had whooping-cough and at 13 he had hepatitis, but neither produced neurological complications.

Drug abuse started when he was 14, amphetamines being passed to him by a fellow choirboy. Within a year he was smoking cannabis regularly and fairly heavily three times a week, and continued to do so. He had taken L.S.D. about twenty times and heroin four times, but discontinued the amphetamines after the first year. He abandoned A-level studies at a technical college and thereafter could only work as a salesman for a short time.

On examination he was excited, exhibited pressure of speech, poor memory, and lack of insight. There were no abnormal physical signs.

At air encephalography diameters A and C (especially C) were increased on both sides. The width of the third ventricle posteriorly was outside normal limits, and the trigone of the left lateral ventricle was rather "square". The area measurement E was also increased on both sides, left more than right (fig. 5).

E.E.G. was normal.

Case 3

A 21-year-old computer operator was admitted for investigation of frequent frontal headaches of a year's duration. He also complained of poor concentration. There was no history of birth injury or other significant illness. At age 8 he had had a minor head injury and was unconscious for half-an-hour but did not require hospital admission.

He had smoked cannabis regularly since the age of 15, had taken L.S.D. twice and amphetamines about ten times. Since leaving grammar school he had frequently changed his work, but after his marriage a few months before admission he had stopped taking drugs, and had stayed in the same job.

On examination has was anxious, morose, and withdrawn. He was unable to give a clear account of his symptoms, about which he seemed very concerned. There were no abnormal physical signs.

At air encephalography the diameters A, B, and C of the left lateral ventricle were well outside normal limits (fig. 6). The width of the third ventricle was outside normal limits also, both anteriorly and posteriorly. The trigonal region was "square" on the left side, the left temporal horn dilated, and the surface sulci rather prominent. The area measurement E was increased on the left side.

Case 4

An unemployed laborer aged 24, son of an academic, complained of depression and left frontotemporal headache over the previous 10 months. He also had attacks of photophobia, not necessarily associated with the headache. During the previous year he had twice briefly lost his sense of awareness. He had not fallen, convulsed, or lost consciousness, and witnesses described him as looking vacant for a few moments. There was no significant past illness, but it was not known whether he had suffered any birth injury nor if there was a family history of epilepsy. Three years previously he had been involved in a motor accident when he had a blow on the head, losing some teeth but without loss of consciousness. Since leaving grammar school, aged 17, he had held many jobs for short periods.

He gave a 4-year history of drug taking, but denied taking amphetamines. He smoked cannabis regularly four times a week, L.S.D. had been taken on about thirty occasions, and mescaline and "mandrax" (diphenylhydramine and methaqualone) occasionally.

On examination he was unkempt, withdrawn, and uncommunicative. He was emotionally flattened, and at times his thoughts were disjointed. There were no abnormal physical signs.

At air encephalography the diameters A, B, and C of the left lateral ventride were all slightly increased (fig. 7). The width of the third ventricle was within normal limits. The left trigonal region was rather "square". The area measurement E was increased on the left side.

E.E.G. was normal.

Case 5

A 20-year-old clerk complained of loss of concentration and memory loss for recent events over the previous 10 months. He had become irritable and depressed and volunteered to being increasingly inefficient and careless at work. His birth had been normal, and there was no history of significant illness or trauma.

He had started taking amphetamines at school when 14 years old, and within a year was smoking cannabis. This had become the main drug of dependence, although he had taken others, including two doses of L.S.D. Cannabis had been smoked once or twice daily over the past 18 months.

On examination he was mentally retarded, thinking with obvious difficulty, and with poor memory for recent events. There were no other abnormal neurological signs.

At air encephalography the diameters A and B were within normal range, but the diameters C were slightly increased. The width of the third ventricle was at the upper limit of normal. The area measurement E was within normal limits.

Case 6

A 22-year-old unemployed man complained of difficulty in recalling recent events, and also of periods of amnesia with occasional headaches. He described permanent alteration of vision after some years of drug abuse, with alteration of bright lights into colors: "On a sunny day I have a lot of extra color without drugs—that's very nice". There was no history of birth injury, trauma to the head, or significant past illness.

He had a 7-year history of drug abuse, starting with cannabis and amphetamine at age 15. Cannabis remained the chief drug, although he had also taken a large amount of L.S.D. and occasional barbiturates. He left school aged 15 and then had 4 months at sea with the Merchant Navy. Since then he had been unable to hold any job for long, and has not worked for the past 4 years. Over the previous 18 months his mental state had rapidly deteriorated, with intermittent confusional states and paranoid psychosis. There seemed to be a striking difference between the bright lively youngster of 14 who was interested in fishing and shooting and was able to strip down and maintain a motorcycle, and the retarded, slothful, emotionally labile, and intolerant man of 22.

He had no abnormal neurological signs.

At air encephalography the diameters A and B were within the normal range but the C diameters were increased (fig. 8). The width of the third ventricle was towards the upper limit of normal, and the right temporal horn was larger than the left. The area measurement E was increased on both sides.

Case 7

A 26-year-old unemployed clerk complained of poor memory and frontal headache. He described several brief episodes over recent months during which he noticed a sensation of heat in the head, pounding in the temples, and loss of vision followed by visual hallucinations. There was no history of birth injury or any subsequent trauma to the head. He had had eczema at age 2 and had been treated with sedatives off and on for several years.

He first smoked cannabis at age 15, but stopped while in the Army for 4 years. He described regular and heavy dependence on cannabis over the past 2 years. A large amount of L.S.D. had been taken but not much barbiturate or amphetamine.

Abnormal traits were characterized by superficial personal relationships, failure to develop any continuing interest, and inability to learn from experience or to apprehend any long-term consequence of his behavior. There were no abnormal neurological signs.

At air encephalography the diameters A and B were within the range of normal, but the C diameters were slightly increased. The width of the third ventricle was towards the upper limit of normal. The surface sulci frontally were rather prominent. The area measurement E was towards the upper limit of normal.

E.E.G. showed paroxysmal slow activity in all areas with no focal abnormalities, and the background pattern was normal.

Case 8

A 28-year-old man had been severely psychiatrically disabled with a schizophrenic illness marked by episodes of excitement and confusion for over 5 years. There was no history of birth injury or other significant past illness.

At age 16 he started taking amphetamines, having left his work as a clerk and joined a group of potato pickers. At this time he also started drinking alcohol heavily. When 17 he smoked cannabis for the first time, and had continued taking it as the preferred drug since then. With money received as compensation for a facial injury he financed a visit with friends to a Spanish island, where he drank a lot of wine, smoked cannabis heavily, and took five doses of L.S.D. despite the fact that it produced devastating reactions. He remained there for 6 months and was probably in a very confused and hallucinated state most of that time. Six months later he was admitted to Whitchurch Hospital with a schizophreniform reaction, and he has been under continual treatment since then.

At recent examination there were no abnormal neurological signs, but over the previous 6 years there have been frequent episodes of apparently spontaneous wide dilatation of the pupils.

At air encephalography the diameters A and B were within the normal range but the C diameters were increased. The width of the third ventricle was outside normal limits, particularly posteriorly. The left temporal horn was dilated and the surface sulci over the left hemisphere were prominent. The area measurement E was increased on both sides.

E.E.G. was normal.

Case 9

This 21-year-old man complained of poor concentration and memory over the past year. He had no significant past illness, head inqury, or birth trauma.

He started taking amphetamines when 14 years old and was soon smoking cannabis and taking barbiturates. From the age of 17 he had occasional L.S.D. and intravenous morphine, but cannabis and barbiturates had remained the main drugs. The recent clinical picture was that of an excited overactive state with periods of confusion. He seemed to have a blurred and telescoped view of his drug-taking history.

On neurological examination he was found to have some clumsiness of fine movement of the left hand.

Serum-aspartate-aminotransferase was raised to 37 I.U. There was no history of jaundice or excessive alcohol intake, and no evidence of hepatomegaly.

At air encephalography the diameters A, B, and C were well within normal limits. The width of the third ventricle was also within normal range. The left temporal horn, however, was much dilated. The area measurement E was well within normal limits.

Case 10

This 26-year-old man was admitted as an emergency with an overdose of L.S.D. He had been unemployed for several years after only a year at university, where he had become less able to continue his work after starting taking drugs. There was no history of birth injury, significant past illness, or trauma.

He gave a 7-year history of drug addiction, starting with amphetamines and cannabis at age 19. By the time of admission he was taking large amounts of these drugs as well as occasional L.S.D. He admitted to being in a perpetual state of confusion and carelessness and complained of poor memory.

On examination after recovery from the acute episode of L.S.D. intoxication, it was noted that he had persistent clumsiness of fine movement of the left hand, but no other neurological signs:

At air encephalography the diameters A and B were within the normal range but the diameters C were increased. The width of the third ventricle was towards the upper limit of normal. The right temporal horn was a little dilated. The area measurement E on the right side was towards the upper limit of normal.

An E.E.G. showed abnormal slow activity in the temporal lobes on both sides.

RESULTS

Descriptions of individual air encephalograms have been given with the case histories. Comparison of the diameters of the lateral and third ventricles showed that, between the control and the drug-abuse groups, the diameters A and B were not statistically different. But the diameters C and D and the area measurement E showed more striking changes, and these were statistically significant. The table shows the measurements and distribution of C, D, and E for the controls and the drug-abuse group. We could not measure D in one control where the posterior diameter of the third ventricle was not well enough shown. The area E measured by planimetry are shown in fig. 3.

MEASUREMENTS C AND D AND AREA MEASUREMENT E FOR THE CONTROL AND DRUG-ABUSE GROUPS

	C(mm.)		D(mm.)		E(cm.²)	
	Right	Left	Anterior	Posterior	Right	Left
Controls:						
A	3	4	3	3	1.8	2.4
B	4	4	3	4	2.6	3.7
C	3	3	4	5	1.6	1.2
D	4	4	4	4	1.8	1.8
E	5	5	4	?	1.4	1.6
F	7	8	4	6	3.4	3.0
G	6	6	5	6	3.2	3.1
H	7	7	5	7	3.0	3.1
I	5	5	7	6	2.4	2.8
J	5	5	4	4	3.3	3.1
K	4	4	3	3	2.9	2.6
L	4	5	4	5	2.9	3.2
M	5	5	3	3	1.6	1.8
Cases:						
1	7	8	5	6	4.6	5.8
2	9	9	5	8	4.0	4.4
3	4	9	8	8	2.6	4.9
4	5	10	4	5	2.9	4.1
5	6	6	7	6	3.2	3.0
6	9	9	6	6	4.0	4.3
7	6	6	7	7	3.2	3.4
8	8	8	8	10	4.3	4.6
9	5	5	4	5	2.1	2.2
10	6	6	6	6	3.4	2.4
Mean of controls	4.8	5.0	4.1	4.7	2.5	2.6
Mean of cases	6.5	7.6	6.0	6.7	3.4	3.9
Posterior	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01

Besides these differences in the bodies and frontal horns of the lateral ventricles there were other isolated abnormal features in the drug addicts. Temporal-horn dilatation was found in five of the cases, and in one of those the dilatation of the horn was the sole abnormality found (case 9). The trigonal region of the lateral ventricles as seen in the prone films was also considered abnormally "square" in three of the cases (see fig. 4), and surface air showed dilated sulci (>3 mm.) in two of the cases in the frontal region. There were none of these abnormalities in the control group.

Study of the diameters A, B, and C and area E showed that on average the left lateral ventricle is slightly larger than the right in both the control and the drug-abuse groups, but that this difference is magnified in the drug-abusers. This asymmetry is not uncommon, but has never been satisfactorily explained. Its relationship to left-sided cerebral dominance is of interest, and in this respect it should be noted that all our patients were right-handed.

DISCUSSION

Significant cerebral atrophy is rare in young people. It may happen after head injury but can be attributed to this only when there has been post-traumatic amnesia of several hours or evidence of focal neurological damage at the time of the injury. (*4*) None of our patients who had had minor head injuries (cases 1, 3, and 4) would satisfy these criteria, and we do not consider that their head injuries played a part in the enlargement of the ventricular

system. Other causes for cerebral atrophy include head injury at birth, especially in prolonged labor or in conditions causing anoxia; and some cases may also be due to hypoplasia rather than atrophy, and differentiation may not be possible. Severe infections in childhood when encephalitis has supervened, congenital syphilis, and toxoplasmosis may cause atrophy, as may congenital or acquired vascular lesions. Other causes include hereditary disease such as Huntington's chorea. Diffuse demyelinating conditions can produce quite rapid cerebral atrophy in the second and third decade. It must be stressed that cerebral atrophy indicates irreversible brain damage. We found no such causes for cerebral atrophy in this series of drug addicts.

Booker et al. (*3*) emphasized that generalized abnormal ventricular size is usually found in diffuse neurological disease rather than focal neurological conditions. They showed that epilepsy is not associated with dilatation of the cerebral ventricles unless the fits are extremely severe and extend over a long period of time. In their series, which his very relevant to our work, there were twenty-five non-neurological cases of a mean age of 3.2 (which is well above our controls and drug-abuse series), and in this group they found a mean lateral ventricular area measurement, determined by planimetry, of 2.90 sq. cm. for the right ventricle and 2.98 sq.cm. for the left. These figures agree with our normal control group and emphasize the difference from the addicted group.

In this epileptic series of 36 patients it is interesting that the mean lateral ventricular area was less—2.54 sq.cm. on the right and 2.60 sq.cm. on the left—both in the normal range. Only in the cases of frank neurological disease did the measurements approach those of our drug-abuse series—i.e., right side 3.9 sq.cm. and left side 4.63 sq.cm.—for this age group. We would emphasize, therefore, that the findings of this ventricular size in our drug-dependent group at this age is abnormal, and although these figures might be found in the seventh or eighth decade they are abnormal for this age group.

The films demonstrate a definite pattern of cerebral atrophy. Apart from the generalized dilatation of the body and posterior part of the frontal horns of the lateral ventricles, the most striking feature is, perhaps, the dilatation of the lateral and to some extent the inferior angle of the ventricle, and the falling away of the floor, combined with the dilatation of the third ventricle. Although no specific conclusions can be drawn from these changes—because similar changes may be seen in parkinsonism and in the atrophy of old age and arteriosclerosis, for example—the appearances do nevertheless suggest that the worst damage is in the region of the caudate nuclei, basal ganglia, and the structures adjacent to the third ventricle. The occurrence of an isolated temporal horn dilatation in one case is of interest, but in another four cases this appearance was combined with the generalized changes in the bodies and frontal horns.

The brains of monkeys given isotope-labelled cannabinols intravenously showed concentration of the drug in the frontal lobes and cortex, geniculate bodies, cerebellum, caudate nuclei, and putamen (*5*)—all structures near the third and lateral ventricles. After 24 hours the drug had spread uniformly throughout the brain. The fat solubility of the cannabinols (*6*) make it likely that they would accumulate in nervous tissue, with its high fat content.

There is a very interesting parallel between the picture shown by encephalitis lethargica and that of chronic abuse of cannabis and L.S.D. This was evidenced in some of our cases by a reversal of sleep rhythms, hallucinations, and mental changes. Hall, writing about the epidemic of encephalitis lethargica, (7) commented:

"If the public asylums have seen little of the disease, the homes of sufferers and the police courts for juvenile offenders told a different story, while in adults the history of 'not being the man he was,' inability to work, being irritable and difficult, a loss of memory and a falling-off in moral character are signs of this infection".

Again, Hall mentions the extreme apathy produced by this disease, which is followed by catatonia, and this indeed is another effect of cannabis both in animals and man.

In encephalitis lethargica, the worst damage was in the basal ganglia, midbrain, thalamus, and floor of the third ventricle, and this is the very area where we have demonstrated atrophy in our patients. Kennedy (*8*) postulated that, in encephalitis lethargica, many of the symptoms were due to interference with afferent impulses, and the same has been suggested about the action of cannabis and L.S.D.

Our findings emphasize the importance of considering organic nervous symptoms and signs in any long-term assessment of the use of cannabis such as is

contemplated in India. The area of the brain showing damage in our cases suggests it would be interesting to examine the cannabis-smoking habits of cases of Parkinson's disease in the Indian population—Parkinson's disease being relatively common in India.

Work on the impairment of recent memory in monkeys given cannabis is also pertinent. (*9*) Several of our patients complained of poor memory for recent events.

von Zerssen et al. (*10*) studied the diameter of the third ventricle in drug abusers and controls by echoencephalography, finding that this measurement was 7 mm. or more in the addicted group and less than 7 mm. in the control. Details of the drugs used and the age-groups were not mentioned.

Cerebral atrophy is known to occur in alcoholism. (*11*) Kálámán found dilatation of the third ventricle in almost all of 87 patients regularly drinking alcohol (*12*) only two of our cases (Nos. 8 and 10) had taken much alcohol, and alcoholism is unusual in heavy cannabis smokers. The pattern of drug taking was similar, in that most of our patients started on amphetamines and with a short time were smoking cannabis regularly. L.S.D. had also been taken, but cannabis became the predominant drug in all cases. For instance, if cannabis had been smoked regularly three times a week for 3 years, it would have been taken over 450 times, and this should be compared with the usual L.S.D. average of ten to twenty doses. It is important to stress that morphine, heroin, or cocaine had not been taken in any significant quantities. Some patients had temporarily ceased to take drugs while in detention or in the Army, and it was therefore impossible to relate the length of history to total dose or the extent of cerebral atrophy.

It may be suggested that our cases were abnormal before they began smoking cannabis, but in at least three cases where we know the history intimately these individuals were entirely normal before they started drug taking. It would be surprising to find cerebral atrophy of no apparent cause in consecutive cases, selected only by their histories of chronic cannabis dependence.

Our findings indicate that there is a particular pattern of cerebral atrophy in a series of young men who smoked cannabis. Although amphetamines and L.S.D. may have an added effect, they are rapidly metabolized and excreted and would not seem likely to have the cumulative effect on nervous tissue of the fat-soluble components of cannabis. We feel that our results suggest that regular use of cannabis produces cerebral atrophy in young adults.

For many years the production of cerebral atrophy in professional boxers was not realized. We would suggest that a similar state of affairs is happening in relation to drug abuse. Far too much attention has been paid to psychological and behavioral disturbances, without relating these to the possibility of permanent damage to the brain.

This work on man indicates an urgent need for further studies of the neurological consequences of drug abuse, and particularly the long-term effects of cannabis smoking. Further radiological and neuropathological studies on man and other primates are suggested. Serial psychometric and encephalographic studies in the young drug-taking population would seem worthwhile.

We thank Prof. W. D. M. Paton, University of Oxford, and Prof. K. T. Evans, of Cardiff Royal Infirmary, for helpful criticism; Miss E. H. L. Duncan, lecturer in statistics, University of Bristol; Mr. J. Banham for the photographic work; and Mrs. Linda Nash for the secretarial help.

Requests for reprints should be addressed to A. M. G. C. and J. L. G. T.

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[The following letter from Professor W. D. M. Paton of Oxford to Senator Gurney was ordered into the record.]

UNIVERSITY DEPARTMENT OF PHARMACOLOGY,
June 4, 1974.

DEAR SENATOR GURNEY: I am writing to you as chairman of the Senate Sub-Committee hearing on 16th May. At this hearing, after my testimony had been taken, Dr. Kolodny was heard. His evidence included a rather severe criticism of a paper entitled "Cerebral Atrophy in Young Cannabis Smokers," by Drs. A. M. G. Campbell, M. Evans, J. L. G. Thomson and M. J. Williams published in the Lancet on December 4th 1971. Since I knew the authors, particularly the senior author Dr. Campbell, who was a senior and very experienced neurologist, and had seen the work developing and the original x-rays, some comment from me might have been helpful. I am writing now, with the suggestion, if you see fit, that my comment might be included as an Appendix to the record, even though one recognizes that it has not been tested by cross-examination.

I took the work seriously for the following reasons:

(1) There were two major difficulties in such work, namely that multiple drug use is becoming the "norm", and that cerebral ventriculography (unlike venepuncture) is not a minor procedure but can only be done ethically if there are valid medical reasons for such an investigation. In the circumstances, the authors did well to find 10 subjects with such a clear dominant pattern of cannabis use (several hundreds of doses) again a varying pattern of much lower use of other drugs. They also did well (as no one else appears to have done) in identifying a group of the same age who were not drug users, apparently free of neurological disease, to provide an estimate of ventricular size in this young age range. Before accepting the detailed criticisms advanced (about head injury and epilepsy), it is worth reading the analysis by Campbell et al. both of these possibilities and of many other possible sources of brain damage which needed to be excluded.

(2) Of all the drugs used by the drug-using subjects, there is little or no evidence that any of them are cumulative apart from cannabis.

(3) Already, at the time of the paper, evidence had appeared that cannabis could interfere with cell-division, and with brain biochemistry—making it perfectly possible that by either, or both mechanisms, loss of brain substance could occur.

(4) Also, by the time of the paper, evidence had appeared suggesting that the action of cannabis, studied by neurophysiological methods, was in the deeper parts of the brain, in regions near the ventricles where (the authors suggested) loss of substance might be occurring.

(5) Dr. Bromberg's paper (cited earlier) as well as later studies have pointed to effects after heavy cannabis use persisting for months at least; and this undoubtedly raises the possibility that anatomical changes occur.

(6) A rather similar type of study (through without a control group) had recently appeared, indicating that heavy alcohol use could produce loss of brain substance (C. Brewer & L. Perrett (1971): Brit. J. Addiction *66*, 170–182). The average age of this series was 50 years (range 39–62). This appeared to be an entirely compatible result, the high fat-solubility of cannabis compared to that of alcohol producing a similar but much earlier adverse action.

The paper by Dr. Campbell and his colleagues was not (and was not claimed to be) incontestable proof that cannabis causes cerebral atrophy. But it is part of a long and fruitful process in medicine whereby evidences of possible causal processes are first brought forward (the paper by Dr. Kolodny and his colleagues is another such, the lack of medical constraint allowing the control procedure to be further advanced). Such evidences are rarely in themselves decisive; but a great deal would be lost if they were excluded—including the first suggestion that smoking was associated with lung cancer.

Yours sincerely,

WILLIAM PATON.

[From Nature, Vol. 249, May 17, 1974]

Cannabinoid Content of Some English Reefers

(By J. W. Fairbairn, I. Hindmarch, S. Simic, and E. Tylden)

This paper reports the results of qualitative and quantitative analysis of 36 reefers or "proreefers" (samples of herbal or resin cannabis sufficient for one reefer) produced in London and Leeds. As far as we know it is the first time reefers in actual use have been so analyzed. The reefers were obtained from three different groups: group A, regular smokers in the London area, some of whom had asked for psychiatric help; group B, regular users in Leeds, none of whom had sought medical advice about their cannabis smoking; group C, casual users in the London area. The results show a very wide variation in potency and indicate that more than half were below the threshold dose.

The contents of each reefer were weighed, examined macroscopically and microscopically and analysed (*1*) quantitatively for the main cannabinoid THC (Δ^1-tetrahydrocannabinol), CBN (cannabinol) and CBD (cannabidiol) (Table 1). Almost all the reefers contained tobacco mixed with varying proportions of resin or herbal cannabis which, when possible, was separated and weighed.

We found a very high variation in potency, the content of the psychoactive substance THC varying from 0.15 mg to 41.1 mg. As this variation has been found in only 36 samples, it is almost certain that similar or greater variation occurs regularly. In view of the known variability in the THC content of the plant (*cannabis sativa L.*) from which the drug is obtained, the instability of the active constituents, especially in badly prepared and stored material and the "unstandardized" conditions in which the drug is distributed the variation is perhaps not surprising. The lack of standardization means that a casual smoker, used to low doses, may be accidentally exposed to highly potent material.

TABLE 1.—COMPONENTS AND ANALYTICAL DATA ON REEFERS

Contents	Weight including tobacco	Cannabinoids (mg)		
Reefer No. (apart from tobacco [1])	(g)	THC	CBN	CBD
Group A:				
1 Soft resin: (0.214 g)	0.744	28.39	Traces	16.68
2 Soft resin	0.752	24.98	Traces	14.65
3 Leaf only: sessile glands (0.511 g)[2]		11.13	Traces	Traces
4 Coarse resin (0.118 g)[2]		8.21	3.10	2.74
5 Compact smooth resin (0.219 g)[2]		5.99	2.73	6.60
6 Resin: fine powder	0.778	5.06	0.89	1.76
7 Crumbly resin (0.224 g)[2]		3.72	1.23	9.36
8 Greenish brown resin (0.102 g)	0.996	3.34	0.55	3.01
9 Compact resins (0.327 g)[2]		2.70	12.14	30.76
10 Brown prism (0.278 g)[2]		2.06	5.38	9.51
11 Compressed herb (0.285 g)[2]		1.97	0.36	2.85
12 Leaf only: sessile glands (0.097 g)[2]		1.89	Traces	Traces
13 Herbal: stalks and seeds	1.135	0.52	4.35	0.64
14 Herbal: tops and seeds	0.460	0.15	0.74	0.11
Group B:				
15 Leaf only, numerous sessile glands	1.724	41.11	Traces	Traces
16 Herb: bracts, leaf, seeds	1.730	18.05	4.89	Traces
17 Herb: stalk, leaf, seeds	1.309	17.56	4.50	Traces
18 Leaf only: sessile glands	1.166	12.92	Traces	Traces
19 Herb: leaf mainly	1.096	11.85	Traces	Traces
20 Herb: stalks, leaf, seeds	0.698	9.56	1.89	----------
21 Leaf: flowering tops, seeds	1.202	7.31	1.74	----------
22 Herb: leaf with sessile glands	0.887	7.11	0.83	4.25
23 Herb: seeds and leaf (0.317 g)[2]		4.48	1.09	----------
24 Herb: bracts, seeds (0.440 g)[2]		3.65	1.05	----------
25 Resin: greenish brown	0.941	2.52	0.52	0.75
26 Leaf and seeds (0.182 g)[2]		1.38	0.16	0.35
27 Herb: bracts, seeds	0.842	0.38	0.16	0.32
28 Fragments of green glass embedded in vegetable debris [2]	0.208	0	0	0
Group C:				
29 Resin: fine powder	1.046	9.37	0.99	5.99
30 Herbal: bracts and leaves	0.910	8.38	0.86	1.36
31 Resin: small lumps	0.553	5.59	0.67	3.64
32 Herbal: unripe floral axis, immature seeds	0.383	5.02	0.71	Traces
33 Herbal: flowering tops, no seeds (0.224 g)		3.00	0.33	1.25
34 Herbal: with traces of resin	0.808	2.02	Traces	Traces
35 Resin: small lumps	0.637	1.38	0.36	2.82
36 Resin: greenish lumps	0.516	0.99	0.26	2.03

[1] All reefers contained tobacco except No. 15.
[2] Pro-reefers, consisting of resin or herbal cannabis sufficient for one reefer.

TABLE 2.—MEAN DAILY USE OF REEFERS

Reefer number	Frequency of use (d^{-1})	No. of users	THC consumed (mg per person per d)
Group A:			
1	7	1	199
2	7	1	175
3	5–10	1	56–111
6	20–30	2	51–76
7	30	1–2	4–11
8	10–30	2	17–50
9	9	1	24
13	20	2	5
14	20	2	1.5
Group B:			
15	1	1	41
16	3	2	27
17	10	2–5	35–88
18	2.5	2	16
19	8	4	24
20	6	2	26
21	4	1–2	15–29
22	20	4	36
23	11	2	25
24	3	1	11
25	20–40	2	25–50
26	15–18	5–6	3–5
27	15–25	3–5	1–3
Group C:			
29	4	3 2	19
30	[1] 1	1	1
31	4	1	22
32	3	1	15
33	2	1	6
34	[1] 2	1	0.6
35	[1] 2	3	0.1
36	[1] 2	3	0.1

[1] (Per week.)

On average each reefer in groups A and C was smoked by two people (Table 2) so that the mean dose of THC per person in group A would be 4 mg (range 0.1 to 14 mg); and in group C would be 2.2 mg (0.5–5.0 mg). For group B, with an average of three people per reefer, the does would be 3.5 mg (0.2–13 mg). These doses are lower than those used by such workers as Numeyer and Shagoury (*2*) (2–9 mg) and Isbell *et. al.* (*3*), who quote 3.5 as a threshold dose and 16.2 mg sufficient to produce distinct depersonalization. On this basis about two-thirds of the reefers, when shared, would produce effects less than that of the threshold value of 3.5 mg THC. Casual smokers may therefore be exposed to extremely small doses and so may falsely assume that cannabis is a relatively harmless substance. Conclusions based on questionnaires to smokers (*4*), such as students are probably of little value unless adequate information on the potency of the reefer is also obtained.

All these doses refer to the actual amounts of THC in the reefers; obviously the amount reaching the blood stream will be affected by the manner in which the reefer is made and, more importantly, whether the user inhales and if he does how long he holds the smoke before expelling it (*5*).

A more important variable is the actual number of reefers smoked by an individual per week. By careful questioning group A was found to consume 3.8 g cannabis per person per d (range 2 g to 6 g); group C 0.3 g (range 0.1 g to 1 g). For group B drug histories were collected using the techniques of participant observation (*6*) and actual weighing of the amounts used. The average amount was 2.8 g per person per d (range 0.3 g to 8.3 g). As the reefers (Table 1) were collected at the time this information was obtained, it is possible to calculate the daily intake of THC on the assumption that the reefer analyzed represented those being smoked at that time. The results (Table 2) show that for group A the average daily dose of THC is 60 mg per person, for group B 26 mg per person and for group C 8 mg. If the first two extremely high values of group A are removed the average for the remainder is 37 mg per person. Although these first two values are high they are not dissimilar from the values of 150 mg THC d^{-1} quoted by Miras for regular users in Greece. (*7*) Some users evidently compensate for low potency reefers by smoking 10–20 reefers d^{-1} and

in these circumstances the reported carcinogenic effects (*8*, *9*) may become significant.

Observation of some individuals, recorded before the analytical results were known, confirms a dose-response relationships. For reefer 15 (41 mg THC per dose) the user admitted he could not smoke more than 1 d^{-1}, otherwise he was unable to co-ordinate his movements. Reefer 22 (36 mg THC d) was from two females whose most characteristic feature was a persistent hilarity; neither was in full time employment. The suppliers of reefers 3 and 8 (17 to 111 mg) were all referred for mild cannabis psychoses, and were depressed and paranoid when smoking heavily. These symptoms disappeared within 2 months of giving up the drug. Reefer 27 (1–3 mg THC d) was from two small subgroups; none of their members exhibited noticeable disorganization of the cognitive processes and all seemed entirely capable of holding full time employment. They seemed similar to the members of group C (casual smokers) who were in full time study or employment. It is significant that students reduced their intake or gave up drug altogether before examinations. Subjects who used reefer 28 (glass fragments plus incense) made it from what they had bought as Turkish pollen hash at £18 per ounce. Although they obviously expected a good high they experienced no subjective euphoria; most reported serious headaches instead.

We found no evidence of adulteration except in reefer 28. This indicates that there is currently no shortage of genuine cannabis. Since THC decomposes into the inactive CBN due to faulty preparation and prolonged storage, the relatively high proportion of CBN in the group A reefers compared with group C indicates significant breakdown. This may come as a surprise to group A as they claimed to be nearer the sources of supply of cannabis, and therefore assumed they were using fairly fresh and active material.

Reefer 3 was grown out of doors in Brixton, London, and collected in July. Reefer 12 was grown in Dublin from Nigerian seeds and "harvested too early". Reefer 15 was from seeds taken from Zambian "bush" and grown on a railway embankment near Leeds; the plants were harvested in September. None of the samples contained the relatively potent flowering tops, yet they had quite high THC content (21.8, 19.8 and 23.9 mg g^{-1} air-dried leaf respectively). These results should therefore dispose of the idea that potent material cannot be grown in a cool climate on unobtrusive sites sometimes with poor lighting conditions. We hope to publish soon details of work on plants grow in this country over several years, which confirm this conclusion. We have already pointed out (*10*) the defect in the present international definition of cannabis as "the flowering or fruiting tops of the cannabis plant (excluding the seeds and leaves when not accompanied by the tops)" (*11*).

Some of the reefers used by experienced smokers were low in THC content but nevertheless were claimed by the users to be satisfactory. One possible explanation is the higher average CBD figures for group A (7.0 mg) than for group C (2.1 mg). CBD is said to enhance the effect of THC (*12*). Furthermore, since this work began, evidence has accumulated that the GLC peak corresponding to CBD sometimes includes small amounts of other cannabinoids (*13*). Synergism cannot be ruled out, and another possible explanation is the presence of noncannabinoid active material in cannabis.

We thank those who suppled up with material and students at University College Hospital, Royal Free Hospital and Bedford College, University of London, who helped to make the necessary contacts in London.

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[From International Journal of Psychiatry, June 1972]

Clinical Effects of Marijuana on the Young

(Harold Kolansky, Chairman, Child Analysis Curriculum Committee, Institute of the Philadelphia Association for Psychoanalysis)

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A five-year clinical study of thirty-eight patients, ages thirteen to twenty-four, produces findings that marijuana alone causes serious psychological and neurological effects. For the moderate-to-heavy user, these can range from mild ego disturbance to psychosis. The ill effects of marijuana are particularly accented in the adolescent, who is struggling to master his disturbing bodily development and normal psychological conflicts. The authors believe that marijuana is falsely classified in the minds of many individuals as a "soft" drug or "harmless escape." They recommend a major campaign to educate the public as to its hazards, further research on its neurological effects, and continued illegalization of all cannabis products.

During the past 6 years as practicing psychiatrists and psychoanalysts, we have seen a clinical entity different from the routine syndromes of adolescents and young adults. Long and careful diagnostic evaluation has convinced us that this entity is a toxic reaction in the central nervous system due to the regular use of marijuana or hashish.

Contrary to what is frequently reported, we have found the effect of marijuana to be not merely that of a mild intoxicant which causes a slight exaggeration of usual adolescent behavior, but a specific and separate clinical syndrome unlike any other variation of the normal or abnormal manifestations of adolescence.

We have found that marijuana and hashish have a chemical effect that produces a brain syndrome marked by distortion of perceptions and reality. This leads to an early impairment of judgment, a diminished attention and concentration span, a slowing of time sense, difficulty with verbalization, and a loss of thought continuity characterized by a flow of speech punctuated with non sequiturs, which leaves the listener puzzled. In time, the chronic smoker develops a detached look as decompensation of his ego occurs.

As a result of marijuana smoking, these symptoms prevail whether they overlay normal or disturbed adolescence. In those individuals predisposed to emotional disorders, the underlying illness may become more pronounced or erupt for the first time during regular use of marijuana. It is around this point that some question has been raised about whether marijuana use is the cause or the result of an individual's illness. We feel there should be no confusion because, regardless of the underlying psychological difficulty, mental changes—hallmarked by disturbed awareness of the self, apathy, confusion, and poor reality testing—will occur in an individual who smokes marijuana on a regular basis whether he is a normal adolescent, an adolescent in conflict, or a severely neurotic individual. Those who are already ill will become additionally affected by marijuana use and thereby reduce their chance for recovery. Those who are balancing between mental health and illness will lose their balance, and those who are healthy will eventually become symptomatic after prolonged exposure to the toxicity of marijuana.

In the past year our 5-year clinical study, "Effects of Marihuana on Adolescents and Young Adults," was published in the *Journal of the American Medical Association*. Since that publication, a significant, and consistently corroborative, response from practicing physicians throughout the United

States has substantially supported the findings of our clinical report. What we described in our study was known already by many clinical physicians because of their daily experience with patients who regularly use marijuana.

There have been many misleading articles by seemingly responsible individuals, minimizing the toxic effects of cannabis derivatives containing delta-9 transtetrahydrocannabinol (the effective chemical constituent of marijuana). Many have even deemphasized the harmful effects on the psychological development of adolescents, with little, if any, conclusive clinical or laboratory evidence. If one searches the available scientific literature of the United States and foreign countries, the weight of the laboratory evidence from findings on animals and humans leaves the reader with little doubt about the need for *caution* in the use of these drugs by the youth of our society. Those few articles that minimize the dangers of marijuana have received the most attention, thus perpetuating the popular illusion that marijuana is an innocent drug. In addition, the comparison between marijuana and alcohol or tobacco is frequently employed as an argument. This only serves to confuse the issue, thereby avoiding an independent assessment of the available medical data on marijuana.

Those who favor its use are insisting that positive proof of marijuana's harmful effects be presented. We have submitted clinical evidence showing the harm that marijuana can cause in the normal development of the adolescent. We knew in advance there would be objections that our results are *only* clinical and not reliable because they were not obtained under controlled experimental conditions. For the practicing physician, the clinical setting is his laboratory where he has become as adept at drawing reliable conclusions from the clinical findings as the laboratory and experimental scientist is in his controlled investigative setting. Many years before the invention of the microscope or the era of the laboratory, physicians practiced medicine by the development of their clinical skills. The causes and effects of numerous medical entities were correctly described and understood years before clinical conclusions were reinforced by the laboratory.

Our society has misapplied caution in its insistence on definitive proof of the ill effects of marijuana, consequently performing a disservice to itself. No purpose has been served other than to allow our young people to go on denying what they themselves know from within—that something happens to their minds after prolonged marijuana use.

We have found that regular and long-term use of marijuana alone is enough to affect adversely and permanently the life of a young person during that fragile state of adolescence. Yet frequently he goes on to the use of other drugs, such as amphetamines, barbiturates, lysergic acid diethylamide (LSD), and heroin. Recently there has been increased public concern about the use of the "hard drugs." Because people have been better informed about their dangerous effects, there has been an increase in the effort to halt general drug use in our young. However, marijuana is usually ignored or glossed over as being less important or secondary to these "more dangerous" and "addicting" drugs. Thus, by a semantic stroke, marijuana has continued in its role as a so-called soft, nonaddictive drug or harmless escape, so that its identity as a mind-altering toxin has remained ignored.

The increased use of heroin by adolescents, which has become alarming, will continue to increase unless our society becomes educated about the dangers of marijuana. Marijuana's destruction of normal mental functioning results in a drug-induced emotional illness which readily prepares the way for the young to seek out "harder drugs" as a solution. Until we are ready to face the medical realities of marijuana use, we will not be able to resolve any of the other drug problems which have invaded our society.

The medical reality that cannabis derivatives have a toxic effect on the higher cerebral functions, which determine the final development of personality, contributes to the special danger of marijuana use to the developing adolescent and young adult. In the following exposition, extracted primarily from our paper, "Effects of Marijuana on Adolescents and Young Adults," we describe the organic, biologic, and psychological effects of this drug.

Between 1965 and 1970 we saw thirty-eight individuals from ages thirteen to twenty-four years, all of whom smoked marijuana. All showed adverse psychological effects: some also showed neurologic signs and symptoms. Of the twenty males and eighteen females seen, there were eight with psychoses;

four of these attempted suicide. Included in these cases are thirteen unmarried female patients who became sexually promiscuous while using marijuana; seven of these became pregnant. In our own observations at local high schools and at several college campuses, we have noted the openness of marijuana smoking. Between twelve million and twenty million individuals in the United States have smoked or are smoking marijuana.

In the last six years we noted a sizable increase in referrals of individuals who showed an onset of psychiatric problems shortly after beginning marijuana smoking. These individuals had either no premorbid psychiatric history or had premorbid psychiatric symptoms that were extremely mild or almost unnoticeable in contrast to the serious symptomatology which followed the known onset of marijuana smoking. In our study, all in this group who smoked marijuana more than a few times showed serious psychological effects, sometimes complicated by neurologic signs and symptoms. In thirty-eight of our patients, our findings demonstrate effects ranging from mild to severe ego decompensations (the latter represent psychoses). Simultaneously, we have examined and treated many other marijuana smokers who either had severe psychological problems prior to smoking marijuana or also used LSD, amphetamines, or other drugs; these patients had more complex findings and were not included in this study of thirty-eight patients because we could not be certain that symptoms were related to marijuana alone. We have studied some neurotic individuals whose symptoms became more severe after smoking marijuana, but, since their earlier symptomatology would becloud a study such as this, we did not include them. Still others who had a marked predisposition to psychosis and who became psychotic after beginning to smoke marijuana were not included in this series, since our purpose was to report only the effects seen as a consequence of marijuana smoking in those not showing a predisposition to serious psychiatric problems. We have also seen many patients older than twenty-four who have been smoking marijuana and have symptoms similar to those we describe.

METHODS

Prior to 1965, we occasionally saw patients who smoked marijuana. The thirty-eight patients described are part of a consultation practice that included about five hundred referrals from 1965 to 1970.

Among our patients we found neurologic impairment in a few who smoked marijuana four or five times weekly for many months. This impairment consisted of slurred speech, staggering gait, hand tremors, thought disorders, and disturbance in depth perception (such as overshooting exits on turnpikes, misjudging traffic lights and stop signs at intersections, misjudging time in catching a baseball, or undershooting a basketball net).

GENERAL PSYCHIATRIC CONSIDERATIONS

The thirty-eight patients studied consistently showed very poor social judgment, poor attention span, poor concentration, confusion, anxiety, depression, apathy, passivity, indifference, and often slowed and slurred speech. An alteration of consciousness that included a split between an observing and an experiencing portion of the ego, an inability to bring thoughts together, a paranoid suspiciousness of others, and a regression to a more infantile state were all very common. Sexual promiscuity was frequent, and the incidence of unwanted pregnancies among female patients was high, as was the incidence of venereal diseases. This grouping of symptoms was absent prior to the onset of marijuana use, except in eleven patients who were conscious of mild anxiety or occasional depression.

There was marked interference with personal cleanliness, grooming, dressing, and study habits or work or both. These latter characteristics were present in some patients prior to smoking marijuana, but were always markedly accentuated following the onset of smoking. In one subgroup a clear-cut diagnosis of psychosis was established; in these patients there was neither evidence of psychosis or ego disturbance nor family history of psychosis prior to the patients' use of marijuana. Several in this group were suicidal. Instead of apathy, in some individuals hyperactivity, aggressiveness, and a type of agitation were common. In no instance were these symptoms in evidence prior to the use of marijuana.

The nature of adolescent development is of importance in a discussion of marijuana. The adolescent may begin to smoke marijuana and then suffer damage in further psychological growth, development, and maturation.

In brief, adolescence has as its central driving force the organic, maturational establishment of puberty. Related to physical changes of adolescence are profound (normal) psychological changes.

The normal adolescent needs support and guided firmness from the parent. If this is missing, he may turn increasingly to drugs. The adolescent living in a ghetto has the added problem of the absence of daily necessities, making reality harsh and the appeal of drugs even stronger. When the adolescent is further exposed to equivocation by authorities in speech or writing on the innocence or dangers of marijuana, then his urge toward a drug solution for conflict may be enhanced. If there has been a lack of support and interest in the child prior to adolescence and a lack of continuing interest, support, and benevolent firmness by the parent in the teenage years, the adolescent may even more readily turn to drugs.

To illustrate the issue of lack of firm guidance, several of our patients had parents who talked to the adolescent of their own curiosity about the effects of marijuana, without emphasizing its dangers. They emphasized the discrepancies in the law without insisting that the youngster not use marijuana or other drugs because of the serious effects that would occur. We have found that equivocation by the parents has contributed to eventual drug experimentation.

Most often the normal adolescent, weakened by his own rising sexual pressures, body changes, and disillusionment with parental ideals, seeks peer relationships to establish new ideals and thereby strengthen his own character. Among his peers today, he finds many smoking marijuana. He cannot tolerate the isolation from those who smoke. Also, the need to repudiate parental ideals is strong. In his desperation to find new ideals, he turns to those who use drugs. Even though their smoking frightens him, gradually he accepts their drug use. He cannot see any changes in his friends as a result of smoking cannabis (early changes are difficult even for the professional to detect). He identifies, however, with their rebellious attitude toward authority as expressed by their use of marijuana. He may then smoke. At first, he is puzzled and disappointed at not reaching a "high" (which he will not admit to his new friends), and he fails to see any adverse effect upon himself other than some exaggeration or distortion of sensory perceptions. He continues to smoke in an attempt to achieve an effect. He thinks his parents and others are alarmists; he can see no harm in "smoking a little pot." He is unaware that increased smoking over a period of time will likely deprive him of the ability to resolve adequately his internal conflicts.

When we examined the effects of marijuana on the adolescents in our study, we were struck by the accentuation of the very aspects of disturbing bodily development and psychological conflicts which the adolescent had been struggling to master. Marijuana greatly accentuates the inconsistencies of behavior, the lack of control of impulses, the vagueness of thinking, and the uncertainty of body identity. Moreover, dependency and passivity are enhanced at a time when the more natural course would be to master dependant yearnings and become independent. Rebellion toward parents and authority is increased while the adolescent should be struggling to abandon such rebellion. His uncertainty about sex grows while he smokes marijuana.

While the adolescent is mentally struggling to master his feelings about his sudden body growth, marijuana smoking causes further changes in his mental image of his body. Struggling to master new physical, intellectual, and emotional strengths, he is also hampered by marijuana, leading to further anxiety. Although he values clear thinking, coherent speech, alertness of reasoning, good attention span, and concentration, he is now confronted with at least temporary interference with these activities.

Our study showed no evidence of a predisposition to mental illness in these patients prior to the development of psychopathologic symptoms once moderate-to-heavy use of cannabis derivatives had begun. It is our impression that our study demonstrates the possibility that moderate-to-heavy use of marijuana

in adolescents and young people without predisposition to psychoticillness may lead to ego decompensation, ranging from mild ego disturbance to psychosis.

Clearly, there is in our patients a demonstration of an interruption of normal psychological adolescent growth processes following the use of marijuana; as a consequence, the adolescent may reach chronological adulthood without achieving adult mental functioning or emotional responsiveness.

We are aware that claims are made that large numbers of adolescents and young adults smoke marijuana regularly without developing symptoms or changes in academic study, but, since these claims are made without the necessary accompaniment of thorough psychiatric study of each individual, they remain unsupported by scientific evidence. No judgment can be made on the lack of development of symptoms in large, unselected populations of students or others who smoke marijuana without such definitive individual psychiatric history-taking and examination.

SOME CLINICAL SUBGROUPS

Borderline states (ego decompensation).—Six individuals fourteen to twenty years of age, five male and one female, were seen in consultation. All these individuals were seen chiefly because of complaints of general detrioration in schoolwork, inability to concentrate or to pay attention in class, gradual decrease in academic standing, apathy, indifference, passivity, withdrawal from social activities, and limitation of interest. All showed evidence of ego decompensation, including disturbance in reality testing, memory, social judgment, time sense, concept formation, concentration, abstract thinking, and speech production. All felt isolated from others. Four of these individuals showed no prior history of these symptoms, although two showed some difficulty in concentration in school prior to smoking marijuana. In the latter two, the difficulty in concentration became far more pronounced following regular smoking of marijuana. The following case study illustrates the borderline state.

A nineteen-year-old boy entered college with an A average. He began smoking marijuana early in the freshman year and within 2 months he became apathetic, disoriented, and depressed. At the semester's end he had failed all courses and lacked judgment in most other matters. Upon return to his home, he discontinued marijuana after a total period of three-and-a-half months of smoking. Gradually his apathy disappeared, his motivation returned, and his personal appearance improved. He found employment, and in the following academic year he enrolled at a different university as a preprofessional student. His motivation and capabilities returned. As do so many of our patients, this young man told his psychiatrist that he had observed changes in himself while smoking marijuana; he even went to a college counselor and told the counselor that he felt he was having a thinking problem due to smoking marijuana. The counselor reassured him that the drug was harmless and that there was no medical evidence of difficulties as a consequence of smoking.

Ego impairment with marked sexual promiscuity.—Thirteen female individuals with similar symptoms to those in the above group, all unmarried and ranging in age from thirteen to twenty-two, were seen in consultation. This group is singled out because of an unusual degree of sexual promiscuity, which ranged from sexual relations with several individuals of the opposite sex to relations with individuals of the same sex, individuals of both sexes, and sometimes individuals of both sexes on the same evening. In the histories of all these individuals, we were struck by the loss of sexual inhibitions after short periods of marijuana smoking. Seven patients of this group became pregnant (one on several occasions), and four developed venereal diseases. Five of the thirteen were engaged in homosexual activities which began after the onset of smoking, and three attempted suicide. Each showed confusion, apathy, depression, suicidal ideas, inappropriateness of affect, listlessness, feelings of isolation, and disturbances in reality testing. Each patient who attended junior high school, high school, or college showed a marked drop in academic performance. The decline in academic performance was in direct proportion to the frequency and amount of marijuana smoking. Most smoked three or more times weekly.

In no instance was there sexual promiscuity prior to the beginning of marijuana smoking, and in only two of the thirteen cases were there histories

of mild anxiety states prior to smoking. We take these results to indicate marijuana's effect on loosening superego controls and altering superego ideals.

Psychosis with suicidal attempts.—Four individuals, two male and two female between the ages of fourteen and seventeen, showed psychotic reactions directly attributable to cannabis derivatives, and each attempted suicide. In the usual type of adolescent psychosis, there is an antecedent history of very poor ego organization. In no instance was there a history of such earlier ego disorganization in these four psychotic patients; nor prior to smoking marijuana was there psychosis, ego disturbance, family history of psychosis, fragile ego, or suicidal attempts.

Psychosis without suicidal attempts.—Four individuals, all male between the ages of eighteen and twenty-four, showed psychoses as a consequence of smoking cannabis derivatives. As with the above group who attempted suicide, this group showed no prior history of ego fragility, predisposition to psychosis, or familial history of psychosis. Characteristic of some of our long-term marijuana smokers who develop paranoid delusions is an ability to function for a period of time without others being aware of their illness. This concealment is possible because they either join groups who share their aberrational thinking or keep their delusional thoughts to themselves.

We have also noted that, as these individuals withdraw from marijuana, delusions are given up more quickly in those patients who have been smoking for a shorter period of time. However, as better reality testing is achieved, these patients seem to be left with a residual of some memory difficulty and impairment of concentration. One patient has shown this for two years at the time of this writing.

It was our impression in these cases that the use of cannabis derivatives caused such severe decompensation of the ego that it became necessary for the ego to develop a delusional system, in an attempt to restore a new form of reality. Apparently this type of paranoid reaction is a direct result of the toxic effects of cannabis upon the ego organization of the patients described in this study.

We have not included in this communication a large number of cases of psychosis due to the use of other psychotomimetic drugs in combination with cannabis derivatives. It is our impression that those patients who had been taking LSD or mecaline or both with marijuana appeared to have more acute psychotic reactions accompanied by greater panic and distress, resulting in more frequent need for hospitalization, than those smoking marijuana alone.

SUMMARY AND RECOMMENDATIONS

Education.—We feel that the National Institute of Mental Health, other responsible mental health agencies, and medical associations should coordinate a large-scale educational effort to inform the public of the serious implications of marijuana use. The press and the networks can aid immensely in this effort. There is at this time enough information to bring equivocation to a halt. The public, and particularly the young, can learn that marijuana alone causes serious psychological and neurological effects.

Unless the marijuana problem is brought under better control, it is unlikely that we will be able to influence effectively the hard-drug problem. All schools, particularly elementary schools, must introduce or improve programs of instruction on marijuana to aid preventive efforts. Measures to control the flow of marijuana must be increased.

Research.—Further research on the neurological effects of marijuana in humans should be continued, as should psychopharmacological effects on animals and man. Additional clinical studies such as ours should be reported. In view of the seriousness of chronic marijuana cough, respiratory studies should be conducted to determine marijuana's effects on the entire respiratory system. Long-range follow-up should be utilized to determine the possibility of marijuana as a potential etiologic agent in lung malignancies. Some literature has already suggested marijuana effects on other body systems, including circulatory, renal, and digestive. This work should continue.

Psychoanalytic and psychiatric research on the interferences in mental function, education, and development should continue.

Studies on recurrence of marijuana effects should be carried out.

Legalization and issues of public health.—If the National Commission on Marijuana and Drug Abuse agrees with the clinical findings presented, then

it may decide, as we have, that marijuana is a public health concern. If the Commission holds the opinion that the Government has a role in protecting public health, then it would be logical that its recommendation would be to prevent the importing, manufacturing, advertising, and sale of all cannabis products.

Many individuals notable in fields other than medicine have advocated legalization of the sale of cannabis. Their opinions are not based on the clinical examination of those who use marijuana, but on hearsay, questionnaires, testimonials, and a misapplication of knowledge. They do a disservice to our young.

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ACKNOWLEDGMENT

This report was presented to the National Commission on Marijuana and Drug Abuse, Washington, D.C., on 17 May 1971.

[From the Journal of the American Medical Association, Oct. 2, 1972]

Toxic Effects of Chronic Marihuana Use

(By Harold Kolansky, MD, and William T. Moore, MD)

Thirteen adults between the ages of 20 and 41 years, all of whom smoked cannabis products intensively (three to ten times per week) for a period of 16 months to six years, were seen during the period of 1969 through 1971. They all demonstrated symptoms that simuultaneously began with cannnabis use and disappeared within 3 to 24 months after cessation of drug use. In addition,

a correlation of symptoms was observed in relation to the duration and frequency of smoking. When coupled with the stereotyped nature of the symptoms regardless of psychological predisposition, a consideration of biochemical and structural changes in the central nervous system (possibly cerebral cortex) as a result of intensive cannabis use seemed to be in order. It would appear that the present medical and public approach to education regarding the danger of marihuana use should undergo some reassessment.

In April 1971 we published a paper describing 38 cases showing the clinical effects of marihuana on adolescents and young adults. (*1*) With continued clinical investigation, we have seen an increasing number of symptomatic cases among preadolescents, adolescents, and young and older adults that have confirmed our original impressions and at the same time have led us to an increasing clinical conviction that there is a specific pathological organic response in the central nervous system (CNS) to cannabis products. This specific response was identified by a group of uniform symptoms common to all which seem unrelated to individual psychological predisposition. As we previously described, symptoms varied from mild ego decompensation to psychotic states. We also considered that clinical findings resulting from chronic cannabis use were suggestive of a temporary toxic cerebral state on a biochemical basis. In a recent study, Campbell et al. (*2*) have demonstrated cerebral atrophy by air encephalography in ten individuals who had smoked marihuana from three to eleven years. The radiological report parallels another one of our clinical impressions that cerebral structural changes may have occurred in some instances of intense chronic cannabis use.

In our report (*3*) to the National Commission of Marihuana and Drug Abuse on May 17, 1971, we again emphasized the deleterious effects of cannabis use on the development of the adolescent personality. Although these effects were described in psychological terms, we stressed our clinical hypothesis that psychic changes were a result of a chemical (Δ9 tetrahydrocannabinol) damage to the cerebral cortical cells. We further indicated that the symptoms described by us should not be confused with the usual psychological phenomena, characterized as either developmental changes or psychological aberrations. All the individuals studied showed some uniformity of symptom response which to us implied that a common toxic agent (cannnabis) was responsible for the observed reaction. We also considered the possibility that similar reactions might occur in any one who intensively used cannabis for an extended period of time. We said:

"During the past six years, we have seen a clinical entity different from the routine syndromes usually seen in adolescents and young adults. Long and careful diagnostic evaluation convinced us that this entity is a toxic reaction in the central nervous system due to regular use of marihuana and hashish."

Contrary to what is frequently reported, we have found the effect of marihuana to be not merely that of a mild intoxicant which cause a slight exaggeration of usual adolescent behavior, but a *specific* and *separate clinical syndrome* unlike any other variation of the abnormal manifestations of adolescence. We feel there should be no confusion, because regardless of the underlying psychological difficulty, mental changes—hallmarked by disturbed awareness of the self, apathy, confusion and poor reality testing—will occur in an individual who smokes marihuana on a regular basis whether he is a normal *adolescent*, an *adolescent* in conflict, or a severely neurotic individual.(*3*)

Even when there is acknowledgment in public comments that marihuana may be harmful to the adolescent, there is very little agreement that cannabis is harmful to adults. This would seem to imply that the effects of cannabis in the adolescent are determined purely by psychological factors, such as the relative instability of the psyche in adolescence with all its individual variations, and also by the setting in which cannabis smoking takes place. We feel that these are secondary factors in determining the effects of cannnabis on human mental functioninng. The direct or indirect chemical effect of this drug on cerebral functioning has seemed to us to be the primary consideration.

Is it true that the toxic manifestations clearly seen in adolescence are not to be found in adult cannabis users? To date we have not seen any difference in the symptomatology of the adult chronic marihuana-hashish smokers we have examined from that seen in adolescents. In the series of adult cases reported here, the uniformity of symptoms, the parallel relationship between the

appearance or disappearance of symptoms with the regular use or discontinuation of the drug, the more exclusive use of cannabis by adults (i.e., with minimal or nonuse of other drugs), the absence of a significant relationship between psychological predisposition, and the type or severity of symptoms that appear during regular cannabis use, all seem to indicate that persistent and intensive marihuana or hashish smoking may affect the cerebral functioning of any individual biochemically in much the same way regardless of age or psychological maturity. There is a stereotyped symptom complex in these cases making a common toxic causality seem self-evident.

SYMPTOMATOLOGY

With a history of regular marihuana or hashish use (three to ten or more times per week), the individual was characteristically apathetic and sluggish in mental and physical responses. There was usually a loss of interest in personal appearance and goallessness. Considerable flattening of effect at first gave an impression of calm and well-being so that the patient seemed to be at peace with himself and the world. This was usually accompanied by his own conviction that he had recently developed an emotional maturity and insight that was aided by or even a result of his generous use of cannabis. Having found his "true self," he claimed that his aggression, ambition, and life goals no longer needed to follow those of the mainstream of society. We considered this to be a defensive use of denial and reaction formation in order to avoid an outbreak of aggression due to diminished stability in his personality organization. His pseudoequanimity was easily disrupted when his personality change, new philosophies, and drug consumption were questioned by old acquaintances or family. Also, if anyone posed a threat to his supply of cannabis, the peaceful facade quickly gave way to irritability or outbursts of irrational anger frequently accompanied by vituperative verbal attack or sullen petulance. This latter phenomenon was described in some of the cases cited by Marcovitz and Myers(*4*) in their report. Grinspoon(*5*) not only fails to see such changes described in other literature as being due to marihuana use but even states:

"I am not so certain, however, that these differences constitute personality changes; it may be more accurate to consider them manifestations of a purposeful and extensive change in life style. . . ."

Most of those we examined were physically thin and often appeared so tired that they simulated the weariness and resignation of some of the aged. All appeared older than their chronological age, an impression that was sometimes reinforced by slowed physical movement. We thought such slow motion resulted from a combination of an emotional lethargy and a slowing of the sense of time; this latter effect has been cited by Melges et al. (*6*) as also contributing to mental confusion in cannabis smokers. Frequently our patients complained of tiredness, sleeping during the day, and wakefulness at night which seemed similar to the reversal of sleep cycle referred to by Campbell et al. (*2*) as a symptom of cerebral organicity.

The symptoms of mental confusion, slowed time sense, difficulty with recent memory, and the incapability of completing thoughts during verbal communication that resulted in confused responses, seemed to imply some form of organicity either of an acute biochemical nature as noted in cases with shorter histories of cannabis use or, one might hypothesize, structural encephalopathy when found in cases with prolonged heavy marihuana use. We are certain that these symptoms cannot be explained simply on the basis of psychological predisposition. Headaches, also described by Campbell et al. (*2*) were common. In one of our cases (not reported in this series), the marihuana syndrome masked a severe obsessional neurosis that was present before marihuana use, then reappeared after cessation of drug use. During marihuana toxicity, his obsessional thinking and compulsive behavior were minimal and secondary to the stereotyped symptoms described above.

METHODS

In general, we (*1*) used the same methodology in the present study as in a previous report. We established the mental status of each patient from a routine psychiatric history and examination. The 13 patients were seen as a part of a psychiatric consultation practice involving approximately 100 patients per

year with an even distribution of the usual diagnostic categories. In order to establish a diagnosis we interviewed each member of this group as well as his family approximately four to ten times in order to establish the patient's history and mental status. After a diagnostic impression was determined, each patient was told of the relationship of his symptoms to chronic marihuana use and each in turn was urged to relinquish the use of marihuana in the hope of reversing his symptoms. Recommendations followed which included psychotherapy and psychoanalysis for two members of the group who had shown predrug psychopathology. One of the individuals evaluated moved geographically, therefore, followup was not possible. Of the remaining ten members of the group, a cessation of smoking resulted in either total or partial remission of symptoms so that only a minimal supportive followup was necessary.

Some individuals raised questions regarding the methodology employed in our previous report. Thus, comment on clinical diagnosis is in order. In obtaining medical history, the technique of drawing diagnostic conclusions by clinical deduction has been a primary method of paving the way to establishing a diagnosis and pointing to the cause. Pathological entities first discovered and etiologically determined by clinicians have been corroborated, then elaborated upon by subsequent laboratory investigation. When an unusual or unfamiliar syndrome is seen clinically, it is first compared with and differentiated from the accumulated knowledge of clinical phenomena. Then after it has been noted that the syndrome occurs repeatedly in the presence of a common factor, and the removal of that factor results in diminished or absent symptomatology, then that factor becomes suspect in the cause of the condition under investigation. Also, if there is an increase in the symptomatology relative to a qualitative or quantitative increased exposure to a substance, then it has been reasonable to assume that the symptomatology is directly related to the presence of the substance in question. After all of the differential diagnostic possibilities are reviewed and thereby eliminated, the clinician may then reinforce his diagnostic impression. By repeated exposure to this procedure in many cases, the clinician may suggest an etiological diagnosis for the new clinical syndrome. Because this clinical method used daily by practicing physicians seems unfamiliar to nonclinicians, it cannot be a foregone conclusion that the application of this method of clinical study and deduction is any less scientific in its approach nor less valid in its conclusions than other methods of investigation.

CLASSIFICATION

In our report on the effects of marihuana on adolescents and young adults, we used psychoanalytic terminology to classify or group the cases according to changes that occurred in the dynamic functioning of the psychic structure. This seemed a practical way to emphasize the importance of the adverse effects of regular cannabis use on the critical developmental mental process during the adolescent stages of life. This was done in terms that were descriptive of the relative intactness of those portions of the psychic structure psychoanalytically referred to as the ego and super-ego.

Such a classification is no less applicable in this report, but we are deemphasizing that psychological classification in order to emphasize the organic implications of our findings, also to emphasize the obviousness of cause and effect. The symptoms seen in the 13 patients imply a biochemical reaction or structural change in cerebral cells as a result of effects of chronic cannabis use.

We have tentatively grouped or classified these 13 cases in the following manner:

1. *Biochemical Change.*—Those cases in which symptomatology indicated less chronic or less intensive use of cannabis or both, and the patients developed total remission of symptoms within a six-month period following the termination of drug use.

2. *Biochemical Change With Suspected Structural Change.*—Those cases in which symptomatology indicated chronic intensive cannabis use; then upon termination of drug use, only partial remission of symptoms were evident after six months and no residual symptoms were found after nine months.

3. *Biochemical Change With Possible Structural Change.*—Those cases in which symptomatology indicated chronic intensive cannabis use; then upon termination of drug use, partial remission of symptoms occurred after six months and residual symptoms were present after nine months or more.

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Group 1.—Case 1.—A 41-year-old white man who was an architect smoked marihuana and hashish for only 18 months in addition to which he took an occasional mild tranquilizer in order to sleep. He was married, had two children, and had practiced in his profession for 16 years. While dating some younger women he was introduced to marihuana smoking. He very quickly started to smoke marihuana daily. Personality change was quite rapid and within months he left his family, had begun divorce proceedings, and had made several professional errors that resulted in severe financial loss to several of his clients. His senior partners demanded that he submit to psychiatric evaluation. When first seen he had been smoking daily for over one year. He demonstrated symptoms of ego decompensation that we attribute to chronic marihuana toxicity, including confusion, distortion of time sense, apathy, forgetfulness, suspiciousness, and poor reality testing. After he realized the adverse effects of marihuana use, he was able to stop smoking with some initial difficulty. Six weeks after stopping completely, his premarihuana-smoking personality was restored and he demonstrated no clinical evidence of either biochemical or structural changes in cerebral functioning. Even though at times his smoking was quite intense, we related his early and complete remission to the relatively short period of time that he had been smoking marihuana.

Case 2.—A 28-year-old white man, who was a teacher in a metropolitan junior high school, smoked marihuana and hashish for three years. He had used lysergic acid diethylamide (LSD) once but used no other drugs except for an occasional barbiturate for insomnia. He was afraid to try amphetamines because he had heard they could cause "brain damage." He began social smoking on weekends and gradually increased to three or four times weekly. Within two years he gave up teaching to become an artist even though he had no previous training or experience in the arts. After he broke a one-year engagement, he had two love affairs resulting in two pregnancies and abortions. His father prevailed upon him to return to Philadelphia to seek professional help. Upon examination he was confused, circumstantial, showed some memory difficulty, and a slowing of time sense. Occasionally an inappropriateness of affect was apparent. Because of considerable reluctance to give up the pleasures of marihuana, he only withdrew gradually from daily smoking. As with a number of our cases he went through a period of distrust and chronic irritability that was accompanied by lying and the sneaking of marihuana. However, as he smoked less, some return of order into his life permitted him to realize the adverse effects of marihuana and therefore he decided to stop smoking completely. After further symptom remission he returned to teaching, then later became active in his father's business. After a short engagement he married. A seven-month followup revealed a remission of his previous symptoms of ego decompensation, but he could not clearly remember a number of life events that occurred during the period of his most intense marihuana smoking.

Case 3.—A 25-year-old unmarried white man, a junior high school teacher, became increasingly sarcastic and verbally abusive to his students, a striking departure from his usual mild mannered behavior. He publicly made fun of other teachers, students, and the school administrators. When seen for evaluation, he revealed that he had been smoking marihuana for the past three years on the average of two or three times per week. During the last six months, however, he was regularly smoking several times each day. He admitted using LSD on two occasions in college but found he was not interested in other drugs. During his last year of college he almost failed because he had not prepared his work and had lost interest in "conventional education." Within the past year he had been asked to vacate two different apartment houses because of late parties and because he frequently provided quarters to transients who were considered "undesirable" by the landlord. His family lived in another city and, therefore, on those occasions when he had nowhere to live he slept in the park; then, upon awakening he went to teach without washing himself or changing his clothes. His daily teaching assignments were poorly prepared and he frequently talked to students in class about irrelevant matters. Later on he began to feel that students called him names and talked about him, so he retaliated with verbal outbursts against them. He occasionally had memory gaps during those weekends when he smoked continuously. He spoke

of ill-defined intense religious experiences; "the messengers of the gods were trying to warn him of his enemies, the police." He felt the country was in great danger of a take-over by the "military." He wanted to leave the northeast in order to be in a warmer climate and to find a place where there would be no competition because he felt that competition caused aggression which in any form was the downfall of man. His conversation was usually rambling and often punctuated with non sequiturs. He frequently asked if he was making any sense and complained that at times he thought he might be losing his mind.

This man showed the type of confusion and paranoia we have found to be a frequent characteristic of heavy marihuana smokers. Quite regularly it was accompanied by a vague self-awareness of mental disorder. After four months he showed only partial remission of his symptoms. Suspiciousness was diminished as was his confusion and forgetfulness. Because he left town before we could determine the presence or absence of symptoms after six months, we have included this case under the group showing only biochemical change.

Case 4.—A 28-year-old white married woman worked as a dental assistant. She had one child in kindergarten, was happily married, and was an energetic worker. Her employer considered her indispensable to his dental practice.

A number of her friends began to have marihuana parties to which she and her husband were invited. She enjoyed cannabis much more than drinking because of "no hangover." For a period of one year, she usually smoked on weekends and only occasionally during the week. Her employer was the first to notice her diminished efficiency when she regularly forgot to process x-ray films and performed poorly in the dispatch of duties that previously had been done flawlessly. In addition, carelessness about her personal appearance, at first almost imperceptible, became increasingly obvious to her friends. Her husband noted that she was more tired and irritable on Mondays and Tuesdays following heavy weekend smoking. Even though her smoking increased, her husband decided to stop smoking himself because he was aware that his sales record had markedly declined as a result of his negligence to details at work over a four-month period. Having done so, he became concerned about his wife. When he asked her to give up smoking, she refused. Now smoking daily she lost her job, then had several love affairs with some of her smoking companions. Shortly after she was referred for psychiatric consultation, she was persuaded to stop smoking. Within three months her thinking became clearer and she returned to her former level of functioning. She was rehired by her former employer and was asymptomatic except for occasional feelings of depersonalization that seemed to pass rather quickly.

Case 5.—A 35-year-old white housewife and mother of two children was a vivacious and quite active individual prior to smoking cannabis. She was respected, competent, responsible, and had no previous history of emotional disorder. She was deeply involved in her home and community and considered by all to be a stable individual. She was introduced to marihuana smoking by a group of adolescents she had been teaching in a community youth organization. She immediately liked the effect and began to smoke regularly because she had understood from all sources that it was harmless. During the last six months of a two-year period she smoked marihuana almost daily. Over the period of two years she gradually identified with adolescents in dress, language, and ideals. Her home and marriage suffered in that they became secondary and sometimes unimportant to her. Without discrimination she wanted to join protest movements and marched for causes that frequently were in juxtaposition with each other. When she was approached by her husband or friends about her activities she became belligerent and verbally assaultive. Over the last six months she had become quite petulant and reclusive. Even her adolescent friends began to avoid her except for the few who brought her marihuana.

At the time of psychiatric examination she showed apathy, mental confusion, forgetfulness, feelings of depersonalization, and impairment of memory especially for more recent events. Time sense was distorted as was her ability to converse coherently. Frequently she would sit for long periods of time remaining detached or immobile especially when she had smoked more than once that day.

Withdrawal from cannabis was slow and difficult. She held the drug in high esteem and claimed it cleared her mind. Gradually as she withdrew she

became depressed and complained of frequent headaches that were not amenable to salicylates. She developed hepatitis that required bed rest for several weeks. With her source of cannabis involuntarily removed by her hospitalization, she returned to her premarihuana-smoking personality. Further psychiatric follow-up after a four-month period revealed that she was asymptomatic. Of her drug experience, she said that the whole past year and a half seemed like a dream.

Case 6.—A 20–year-old college student was referred by her family physician because of a marked and relatively sudden change in behavior and life style. She had been an outstanding history major until the previous year when she gave up living with a roommate, lived as a recluse, stopped attending classes regularly, did not turn in assignments, frequently spent days in bed, appeared apathetic, confused, withdrawn, and asocial. She often had periods of marked depression, felt there was no purpose in school life and gave up her history major, shifting her interest to economics, music, and then art. In each field, she failed to study or produce and had strong wishes to drop out of school and live in a commune.

During psychiatric examination she was lethargic, had difficulty concentrating, had trouble with memory and attention span, and spoke of long periods of depression and sleeplessness. She had aimless relations with her former friends and had no greater ambition "than to turn on with a joint." She moved slowly and without purpose and had frequent headaches. Her symptom complex had begun within months of beginning to smoke marihuana first on weekends and then two or three times each week. At the time of referral she was smoking four times each week. A review of the absence of symptoms prior to the use of cannabis, the correlation of her apathetic withdrawal from responsibility, and her thinking disorder with the onset of cannabis use motivated her to try to give up using marihuana and within two months her smoking stopped. Within weeks after that, much of the confusion, apathy, and poor memory had disappeared. She returned to college, on a more limited basis, and gradually had a return of interest. At the time of this writing, it was not yet six months after cessation of cannabis use but she had had a recovery to most of her precannabis-smoking personality. She had used amphetamines on three occasions early in the period when she began marihuana use but had given these up because her gratification with marihuana was more intense.

Group 2.—Case 7.—A white man, 24 years of age and a Vietnam veteran began smoking while in Vietnam. He had never tried any other drugs but thoroughly enjoyed smoking marihuana and especially hashish. Shortly after returning from the service, he began to smoke two to three times weekly and within a few months progressed to smoking every day which was to be his habit for the next two years. Personality change was marked by apathy, irritability, reclusiveness, slovenliness, mental confusion, frequent loss of recent recall, losing and misplacing things, forgetfulness, and distortion of time sense so that he even appeared at times to walk and move as though in slow motion. He would not seek a job nor would he make plans to further his education. He rationalized that he did not want to become a "slave to the system" and needed a rest. He dated infrequently and seemed to have no personal interests other than to maintain his supply of marihuana and hashish. Eventually he left home and hitchhiked to the southwestern part of the United States. He lived in a commune for a while then left for California in order to embrace a far eastern religion. After one year he returned home, at which time he was referred for psychiatric evaluation. He slowly and reluctantly gave up cannabis use over a period of six months and gradually he returned to his premarihuana-smoking personality. He decided to enter a community college but was fearful that he would not be able to think clearly enough to do the work. He managed to do well academically but with great effort because he had difficulty with memory work, concentration, and sentence construction. As with so many patients in our experience, he realized that marihuana had caused severe impairment of his mental processes. For a ten-month period he had not smoked but, even though he knew he should not use cannabis any further, he still longed for it most of the time. Frequently he would get a "high feeling" without apparent cause, while sitting in a classroom or while driving a car. On several occasions while driving, he became so frightened that he pulled over to the side of the road until the feeling of being "high" left him. Further psychiatric followup is presently in progress.

Case 8.—A white man, 26 years old, was employed as a real estate agent. He had done well in college and was considered to be one of the brighter young men in a rather large national real estate firm. He was married but had no children. He and his wife began running around with a "pot-smoking crowd." Together they only smoked on weekends, however, he began to smoke alone during the week. It rather quickly became a regular habit and before the year was out he smoked daily. Eight months later he lost his job and took up stone sculpturing as a result of a close friendship with an artist. Eventually he was supported financially by his wife who had stopped smoking because she felt the drug confused and depressed her. Although the patient had no interest in taking other drugs, he revealed a special liking and daily desire for hashish. He also developed apathy, confusion, irritability, disturbance of time sense, forgetfulness, and some inappropriateness of affect. After 18 months of smoking he became interested in an Indian religion and borrowed some money in order to travel to that far eastern country. When he left his wife in order to do so she consulted one of us.

By the time he returned to this country five months later, further mental deterioration was evident to all. He showed confused thinking, circumstantiality, and paranoid ideas. Withdrawal from the drug was difficult because of the patient's intense fondness for hashish. However, with persistence and family support, he stopped smoking and as he did so, his symptoms remitted concomitantly. Six months after cessation of drug use he was again gainfully employed, reunited with his wife, but greatly shaken and disillusioned. He still demonstrated some difficulty with concentration, some slowed time sense, and occasional mild feelings of being high with no apparent stimulus. At the nine-month followup he indicated that he had some feelings of depersonalization.

Case 9.—A 28-year-old white schoolteacher smoked marihuana and hashish for six years. He admitted to the use of LSD on three occasions, each accompanied by a typical "acid trip" early in his drug history, the last of which caused such terror as to make him stop using it. He began smoking marihuana while he was a college senior. Over the next few years he progressed from weekend smoking to using the drug three to four times per week. As a teacher in a boys' boarding school he spent a great deal of his spare time with the students discussing philosophy and politics. When it was discovered that he had encouraged students to smoke marihuana he was in trouble with the school administration. Finally his advocacy of the violent overthrow of the Government resulted in his dismissal. Shortly afterward he obtained a position at another private school and within the year had repeated his earlier experience. In addition, he developed a disinterest in sexual relations with his wife and became interested in "depth philosophy" which he understood rather poorly. His estrangement from reality became more obvious to all. When he was prevailed upon to withdraw from marihuana use, a minimal return to his previous personality occurred, but the remission was still not complete after eight months. Even though his cognitive thinking was more sensible and he seemed to be more firmly rooted in reality, he still complained of difficulty with concentration and sometimes during conversations he had a tendency to forget the content of his statements.

As with some other cases in this series, many years of marihuana use seems to have resulted in symptoms that endure for many months after cessation. This seems to at least imply some structural change of the CNS beyond a more transient reaction that one would expect in a reversible, biochemical, cerebral response. The persistence of a flatness of affect interspersed with an occasional uncontrolled outburst of giggling and laughter or a brief inappropriate temper tantrum accompanied by long periods of petulance, the frequency of headaches that were not present before marihuana use, the consistent demonstration of poor social judgment, the occasional mild feeling of "a high" without drug stimulus are frequent residual symptoms among long-term cannabis users we have examined. This patient also complained of some difficulty with his memory, especially in recalling recent events.

Group 3.—Case 10.—A 34-year-old white advertising executive smoked marihuana for 3½ years but took no LSD or other drugs. He was married for 12 years and the father of three children. For ten years he was considered one of the more gifted and promising members in a prestigious advertising firm.

During his first year of weekend smoking he became perceptibly less ambitious and energetic. He was less attentive to details at work and showed less interest in his family. His wife had accompanied him in smoking and generally supported his less ambitious outlook on life. After habitual, forgetful, and costly blundering, his partners "bought him out" of the firm. As he increased his marihuana smoking over the next two years, personality deterioration was more in evidence and he drifted from one job to another as the periods of unemployment grew longer. Finally after 3½ years of smoking, by now on a daily basis, he was referred for psychiatric evaluation.

Marihuana use was given up by the patient with considerable difficulty. He became irritable and argumentative when he could not smoke marihuana and on two occasions resorted to physical assault upon two family members after they had found and confiscated his supply. Recovery was gradual but after a period of six months of total abstinence he returned to his pre-marihuana-smoking personality. After several interim jobs he again found employment in his chosen profession.

In the one-year followup interview, he complained of occasional mild feelings of depersonalization and transient states of mild confusion. He also felt his memory was not as good as it once had been and he had considerable difficulty in concentration, especially when reading or when writing business correspondence.

Case 11.—A white man, 32 years old, smoked marihuana and hashish for a period of four years. Before he smoked he was gainfully employed as a successful tree surgeon. He was ambitious and considered to be a stable and sensible man. He was happily married and a devoted father to his three children.

After he had been introduced to marihuana smoking at a party, he smoked socially and on infrequent occasions (one to two times monthly). Within a year he had increased his marihuana smoking to three to four times weekly and finally almost daily for a period of three years. Changes in his personality occurred slowly and were only discernible to those who knew him well. At first he became somewhat careless about his personal appearance and bathed infrequently. He began to oversleep in the morning and was frequently absent from work so that a coworker had to take over double duties. He became irresponsible in maintaining company records and was irritable with clients and his superiors. He frequently fought with his wife over smoking, especially when she began to express concern over his changing attitudes toward work and family responsibilities. He castigated her for being "materialistic" and rationalized his lack of industry and decreased ability to provide for the family as the fault of "society" for requiring that a man "overproduce in order to keep the captains of industry wealthy." He touted a self-styled pseudo-socialism, then went through a rapid transition from an interest in health foods to macrobiotics. When he became unemployed and went on relief, his wife and family physician talked him into having a psychiatric evaluation.

He withdrew from smoking cannabis with considerable difficulty over a three-month period of time. Eight months after he stopped smoking, some semblance of his premarihuana-smoking personality returned and his former employer rehired him because of the excellent job he had done prior to using cannabis. A one-year followup revealed that he still had some difficulties with memory and concentration. Fortunately his occupation required little of the latter and he was able to perform his duties satisfactorily. Occasional irritability and some inappropriateness of affect were present. He complained of frequent feelings of depersonalization or "feeling high" if he smoked too many cigarettes, drank too much coffee, or took too many aspirins for his headaches which were frequent and of long duration since he had given up cannabis. He expressed a strong desire to go back to smoking marihuana and was greatly discontended with his life. We did not feel this man's eventual prognosis was too hopeful. When he refused the recommendation for psychotherapy, we thought it was likely that he might return to cannabis use at some future time.

Case 12.—A 38-year-old, white, married English professor, after smoking only on weekends for about 18 months, increased the use of marihuana and hashish to a daily basis and continued to do so for over four years. He taught his classes regularly and also held private seminars with chosen students during which time marihuana smoking was encouraged in order to "think more

clearly." In addition to considering himself a visionary, he imagined he was the reincarnation of Hamlet who conversed with his dead father during solitary walks around the campus at night. He gradually turned his interests to mysticism, then asked for a one-year sabbatical to be spent in solitary contemplation. During the heaviest period of smoking, he was most seclusive and in order to be alone walked out on his wife and children for a period of six months. Because he eventually embraced an eastern religion that forbids the use of drugs he slowly withdrew from the cannabis habit. As he did so, his thinking became clearer and his memory improved; however, after six months he still had difficulty with immediate recall, often demonstrated by his forgetfulness and frequent loss of personal belongings. He returned to his interest in English literature and after 14 months of abstinence from cannabis, he was able to obtain employment in a small private school. One year after cessation of marihuana use, he demonstrated and complained of some difficulty in maintaining long periods of concentration and an inability to satisfactorily convert his thoughts into written or spoken words. There was also evidence of occasional inappropriateness of affect. Physically he appeared to be at least 15 to 20 years older than his chronological age.

Case 13.—A 23-year-old unmarried social worker was referred for diagnostic study following an unwanted three-month pregnancy terminated by abortion. This young woman had been smoking marihuana for four years. At first she had smoked only on weekends, but after six months she began to smoke three to five times weekly. She had always exhibited some immaturity in her personality, characterized by a tendency to confide in her mother more than was appropriate for her age, and a "little-girl-like" attitude with her friends. However, she had been a capable student and worker, had many friends, read considerably, and thought clearly. Gradually, after beginning to smoke marihuana, her friends noticed that she became confused, loquacious, and silly in her affect. Her case work deteriorated and she was criticized by her supervisor for slovenly appearance and failure to prepare case material. She began dating men of a much lower social status and began for the first time to have frequent and indiscriminate sexual affairs. This previously cautious person paid no attention to the lack of precautions taken by her lovers, resulting in gonorrhea and finally in an unwanted pregnancy.

Upon examination her mood was inappropriately gay for the circumstances; she was not able to give coherent history, thinking was slow, attention span was poor, and ability to concentrate was impaired. She giggled a lot, complained of headache, and her speech was slow and slurred.

Gradually she told the examiner about her forgetfulness, lack of caution with her lovers, and the marked slip in her case work ability and presentation. She also revealed that since the increase in marihuana smoking she was frequently criticized by her superiors and friends for disheveled appearance, forgetfulness, and silly laughter.

Because of her previous immaturity, intensive psychotherapy was recommended. Within two months of beginning the treatment she stopped marihuana smoking. Within three months there was a lessening of the confusion and poor attention span. At the end of nine months the confusion, lack of concentration, poor attention span, and inappropriate appearance had disappeared. At the end of nine months her slurred speech was no longer evident. At the end of two years of treatment she still had occasional headaches, and an occasional "high period, exactly like those I had while smoking." These include the giggling, a loss of time sense, and a devil-may-care attitude. We have noted this return of a marihuana-like high in several of our chronic marihuana smokers up to two years after smoking stopped.

SOME IMPLICATIONS

A topical review of the 13 individuals seen shows a definite correlation between the presence of symptoms and cannabis use. Eight of the group reported had taken no other drugs. It is unlikely that the minimal use of other drugs reported in the remaining five could account for their symptomatology. One of them used meprobamate infrequently, one used amphetamines three times, and of the remaining three one had taken LSD only once, another had taken it twice, and a third three times. Therefore, we thought it unlikely

that any drug other than cannabis could have been the causative agent in producing the symptomatic changes in any of the 13 patients. The intensity of symptoms and the presence of delusional content during use of the drug seemed directly related to the frequency and length of time that cannabis had been used. There also seemed to be some relationship between symptom intensity and the strength of the drug that was used. Those who smoked hashish seemed to be more symptomatic. The length of time necessary for the remission of symptoms also appeared to be directly related to the duration and frequency of smoking. In adition, the presence of residual symptoms months after cessation of cannabis use showed some relationship of the symptom residual to the duration and frequency of exposure. Lemberger et al. (7) have shown that the chemical constituent Δ9 tetrahydrocannabinol is maintained in the brain and other organs of humans for up to eight days after ingestion. McIsaac et al. (8) in 1971 showed with isotope labeled cannabis that concentration of the drug occurred in the frontal lobes and cortices of monkeys. Campbell et al. (2) in 1971 have pointed out that findings that indicate the fat solubility of cannabis derivatives makes it likely that the accumulation of this drug in nervous tissue would thereby cause a cumulative chemical effect. This cumulative effect seemed to be demonstrated clinically by those cases in this report who had relatively brief histories of cannabis use. In these individuals the biochemical effect is less likely to be confused by later structural change. During the period of time between cessation of drug use and symptom remission, those symptoms present are probably due to the effect of accumulated chemical effect rather than structural change. In addition, patients one through six all told of sometimes feeling some of the effects of cannabis for several days after their last smoke. Rosenkrantz et al. (9) indicated that in the brain tissue of all rats examined, there was a consistent severe loss of brain protein and cell component RNA that play basic roles in brain function. The occurrence of a stereotyped group of symptoms unrelated to psychological predisposition in a number of individuals following chronic and extensive cannabis use seems to us to at least imply the possibility of a similar biochemical application in humans. In those cases where symptomatology, though diminished, was still present six months, nine months, and one year after drug withdrawal raises an important possibility of more permanent structural changes in the cerebral cortex, such as reported by Campbell et al. (2) in all of their cases (all smoked three or more years), and all of whom showed radiologic evidence of cerebral atrophy.

After seven years of clinical observation, we have become concerned that marihuana and hashish use adversely affects cerebral functioning on a biochemical basis. In the mildest cases there appears to be a temporary toxic reaction when small amounts of cannabis are consumed over a short period of time. However, in those individuals who demonstrate stereotyped symptomatology after prolonged and intensive cannabis use, the possibility of structural changes in the cerebral cortex must be raised.

The increasing accumulation of information indicates a need for a more cautious approach to marihuana use and it becomes even more imperative that there should be an increased number of investigative studies by other medical specialty fields such as neurology, radiology, physiology, and pharmacology, in order to more clearly establish the qualitative and quantitative effects on humans of this drug that has become so widely used in the United States during the past ten years.

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Cannabis as a Long-Acting Intoxicant*

Editorial Summary

(By Conrad J. Schwarz, M.B., Ch. B.)

1. Canadian, British and American national Commissions studying cannabis in recent years have consistently agreed that it is a hazard to health and that its use should be discouraged. These conclusions have been largely underreported by the media, which have focused most attention on the controversial political, philosophical and legal discussions and recommendations.
2. A Thirteenth Century Medieval impression of the persistence of cannabis in the human body for prolonged periods of time has recently been confirmed by modern chemical tests.
3. Clinical observations suggest that this persistence of chemically active ingredients in the human body is associated with ongoing psychological and physical effects.
4. Physical and behavioral tolerance with increased dosage need can be observed in regular cannabis users.
5. Studies suggest possible permanent cell changes in human lung and brain tissue.
6. Health professionals should pay more attention to the continuing effects of cannabis in regular users, and should encourage them to discontinue use, which step will not infrequently bring about improvement in psychological and physical health and thus demonstrate a presumptive relationship between cannabis and the symptoms.

This paper will present some of the clinical and biochemical evidence which indicates that ingredients of cannabis sativa have prolonged action in humans, that the effects of this action are discernible in regular users, and that these effects require the attention of the clinician in the assessment and treatment of cannabis users.

This understanding has developed over about six years of clinical observation, study of the literature, private, public and professional debate, and gradual refinement of ideas in a series of published papers. (*1–5*)

It was only towards the end of this six years that there came to attention a Thirteenth Century reference which anticipates the current understanding. Rosenthal (*6, p. 100*), translating from original manuscripts, describes the medieval moslem recorder, Az Zarkashi, as stating the following of a certain Shaykh, Ali Al-Hariri, a Thirteenth Century religious leader:

"This Hariri was very hard on habitual users of hashish. One of his followers sent a messenger to him to upbraid him for his attitude. The Shayk said to the messenger 'If the man mentioned is one of my followers, so that I have to oblige him, let him give up hashish for 40 days until his body is free from it, and 40 more days until he is rested from it after having become free. Then let him come to me so that I shall inform him about it.'"

This observation can, of course, be dismissed by some because it is based only on "clinical" observation, the author does not present a control group for comparison and there is no demonstration in it of any direct cause-and-effect relationship between hashish and the implied state of functioning of the individual concerned. Outright rejection of such clinical impressions has been common in the marihuana debate, but nonetheless cautionary clinical observations have persisted over the centuries.

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* Paper read at the Annual Meeting of the North Pacific Society of Neurology and Psychiatry, Vancouver, B.C., April 5, 1973.

For example, the original volumes of the British Indian Hemp Drugs Commission Report of 1893–4 (7) give in considerable detail the verbatim testimony of the 1,140 medical and nonmedical witnesses who appeared before it. Only two declared that the excessive use of cannabis was not deleterious in the long run, and only 243 (21.3%) were prepared to accept that even the moderate use of cannabis was not deleterious.

In more recent times, the main bodies of the three major national commission studies on cannabis, in Britain, America and Canada, contained a considerable amount of evidence which led each of these commissions to conclude that the use of marihuana and hashish should be discouraged. Despite the wide publicity given to the humanitarian, philosophical and legal discussion of the use of cannabis, the generally underreported clinical material in the main bodies of these reports is largely of a serious cautionary nature, particularly in relation to long term use.

The 1968 British Wootton Report (8) concluded that cannabis was a "dangerous" drug (Section 70) and that "in the interests of public health, it is necessary to maintain restrictions on the availability and use of this drug." (Section 71)

Again, the President's Committee in the United States, in March, 1972, in its first report (*9*), recommended "to the public and its policymakers a social control policy, seeking to discourage marihuana use, while concentrating primarily on prevention of heavy and very heavy use." (Page 134)

In May, 1972, the Commission of Inquiry into the Non-Medical Use of Drugs (*10*), in Canada, concluded that in relation to cannabis "there must be a continuing policy to discourage its use" (Page 301) on the grounds of individual and public health concerns, which the Commission summarized as follows:

"To sum up, then, it seems to us that there are at least four major grounds for social concern: the probable harmful effects of cannabis on the maturing process in adolescents; the implications for safe driving arising from impairment of cognitive functions and psychomotor abilities, from the additive interaction of cannabis and alcohol, and from the difficulties of recognizing or detecting cannabis intoxication; the possibility suggested by reports in other countries and clinical observations on this Continent, that the long term, heavy use of cannabis may result in a significant amount of mental deterioration and disorder; and the role played by cannabis in the development and spread of multidrug use by stimulating a desire for drug experiences, and lowering inhibitions about drug experimentation." (Page 274)

This much abbreviated general introduction indicates that a high level of suspicion surrounding cannabis has survived over centuries. The question arises as to whether or not there is any common factor underlying this shared opinion arrived at in different countries, at different times and by different methods of study. Since sociologists, philosophers, lawyers, religious leaders, politicians, et cetera have advanced their theories, it does not seem inappropriate for a clinician to suggest his. Quite against the tide of modern theory this clinician would like to direct attention to the drug itself, not because it might be the only factor, but because it is the factor which seems to have been most ignored to date.

The evidence that cannabis, in terms of human behavioral response, is a long-acting intoxicant is based on the following points:

1. The active ingredient remains in the body for long periods of time.
2. The effects persist beyond the obvious stage of acute intoxication.
3. There are similarities between the acute state of intoxication and the general functioning of the regular user.
4. Effects in the regular user show improvement on discontinuation of cannabis.
5. Cumulation and tolerance can occur with cannabis.
6. In at least two systems of the body there is preliminary suggestion of cellular change.

PERSISTENCE OF CANNABIS PRODUCTS IN HUMANS

The Lemberger group (*11*), using radioactive-labeled THC, demonstrated that this active ingredient of cannabis persisted in human plasma for at least three days in active form, and that metabolites continued to be excreted in human feces for at least eight days. More recently, this group (*12*) has shown that the metabolites of Delta–9–THC, particularly 11–hydroxy-THC, appear in

plasma very rapidly after inhalation, and somewhat more slowly after oral administration. In both cases, the psychological effects reach a peak with peak levels of the metabolite rather than with the peak levels of the Delta–9–THC itself. From this, Lemberger has concluded that the psychological effects are more likely to be due to the metabolite than to the original substance. The significance of this is that the metabolites persist in the body longer than Delta–9–THC, and if they are continually active, as suspected, this may explain the prolongation of effects sometimes seen in users. It also offers a modern biochemical basis for the Thirteenth Century observation of Al-Hariri.

PERSISTENCE OF CANNABIS EFFECTS IN HUMANS

In keeping with the biochemical findings of the Lemberger group, the acute features of intoxication can persist beyond the average four hours generally reported. If this occurs, the individual may continue in an acute confusional state for several hours to several days, with fluctuating sensorial impairment much more suggestive of a continuing toxic process than of an endogenous psychotic rection (*13*). In this state there may be persistent minor physical upsets and a continuation of a mild high, the latter often being described as a subjective feeling of being "spaced out", with difficulties in concentration, attention and immediate memory.

SIMILARITIES BETWEEN THE ACUTELY INTOXICATED INDIVIDUAL AND THE REGULAR USER

The acute effects of cannabis show similarities to some of the features which have been ascribed to regular users. For example, impairment of immediate memory, attention and concentration occur in the acute intoxicated state and have been described as continuing characteristics of regular users (*14, 15, 16*). On direct inquiry, such users not infrequently admit that memory is not as good as it used to be. Names of friends and routine tasks may be forgotten, and there may be a decline in the extent of vocabulary available to the individual so that he may be unable to find what should be a familiar word.

The predominant feature of the acute state of intoxication is one of euphoria, which is seldom defined but seems to apply to the general subjective state of the individual, which is described as one of wellbeing, contentment and satisfaction in the absence of external stimuli which would justify this feeling. Some regular users demonstrate a feeling of contentment and acceptance of a general life situation which objectively involves a diminution in real life stimuli and a lower level of functioning than previously. Some regular users remain happy within themselves as their work capacity, ambition, motivation, living situation and personal hygiene decline. (*14, 15, 16*).

Other similarities between the acute state of intoxication and the general functioning of the regular user involve the distorted sense of time, suspiciousness, paranoia and grandiosity, and also the mood changes.

These similarities have been presented in more detail elsewhere (*5*) and the point may best be illustrated by contrasting and comparing two separate descriptions of the different states.

Melges et al. (*17*), in describing the concept of temporal disintegration which they regard as basic to acute marihuana intoxication, give this general description:

"The individual has difficulty in retaining, coordinating and serially indexing those memories, perceptions and expectations that are relevant to the goal he is pursuing." (P. 1118)

This statement seems to encompass and may even explain most of what West (*18*) is saying in his sketch of certain regular users:

"The experienced clinician observes in many of these individuals personality changes that seem to grow subtly over long periods of time: diminished drive, lessened ambition, decreased motivation, apathy, shortened attention span, distractibility, poor judgment, impaired communication skills, loss of effectiveness, introversion, magical thinking, derealization and depersonalization, diminished capacity to carry out complex plans and prepare realistically for the future, a peculiar fragmentation in the flow of thought, habit deterioration and progressive loss of insight." (P. 461)

West concludes from this description:

"There is a clinical impression of organicity in this syndrome which I simply cannot shake off or explain in any other fashion." (P. 461)

REVERSAL OF SYMPTOMATOLOGY ON DISCONTINUATION OF REGULAR USE

The general functioning of the regular user improves if he discontinues use. Such improvement has been reported both in psychological features (*5, 14, 15*) and in physical health. (*19, 20*) Users report back after two or three weeks of abstinence from cannabis that they are feeling much better ("I hadn't realized I was so tired previously."), thinking more clearly ("It's as if a fog I was not aware of had lifted from my mind."), and beginning to pick up new interests ("I hadn't realized I had dropped so many old friends."). Memory is subjectively improved, irritability is diminished, and sleep patterns which may have been disturbed are normalized.

TOLERANCE

It has been stated that not only does tolerance not occur with cannabis, but, in fact, reverse tolerance is the rule in that the individual who uses cannabis can come to require less than he needed at the beginning. This has been subjectively reported fairly consistently, although its explanation has not been clear. It may simply be that once one gets into regular use, one establishes connections with a more reliable supplier, who provides more reliable material. On the other hand, as past clinical observations and recent biochemical work have suggested, it may be related to the fact that cannabis contains long-acting chemicals which persist in the human body for a considerable period of time. Thus in the initial stages, the regular user of cannabis may show reverse tolerance and need less simply because he still has some residue in his body and is only topping up a partially empty gas tank.

Eventually, however, there are indications that actual tolerance can develop. This is shown in the work of the Tennant group (*19, 21*) with American GIs in Germany, a number of whom reported consistent doses over 50G of hashish per month (500 marihuana cigarettes a month) ranging up to 600G per month in some individuals (6,000 marihuana cigarettes a month). Miras (*20*) has also confirmed that some of his patients in Greece require up to 6G of hashish (60 marihuana cigarettes) in order to get high. Such responses suggest some degree of physical and behavioral tolerance.

POSSIBILITY OF CELLULAR CHANGES

Finally, there are two aspects of the possible long term effects of cannabis which suggest that what is generally a temporary, reversible state of low-grade intoxication may at some point change to one of altered cell structure, which may be of a more permanent nature.

The Tennant group have followed up their earlier clinical observations with direct studies of lung tissue obtained from some of their heavy cannabis-using soldiers. In a personal communication (*21*), Tennant has reported the microscopic findings on lung biopsies from 17 of their cases and the complete autopsy on one soldier user who died in an accident. The men were all American GIs stationed in Germany. The accident victim and 16 of 17 others were white and the age range was 18–22. They all reported very heavy use of hashish above a level of 50G per month, which is equivalent to about 500 marihuana cigarettes monthly or about 17 marihuana cigarettes daily.

On microscopic examination, the lung tissue examined showed no normal epithelium in any samples; instead, there was squamous cell metaplasia and atypical cells in all samples, and basal cell hyperplasia and subepithelial gland changes in most. These findings were compared to those of other studies of cigarette smokers of different ages and of nonsmokers. The Tennant group concluded "The respiratory epithelium of the hashish smokers . . . resembles more closely that of heavy cigarette smokers of a much older age group than either light smokers or nonsmokers. It also more closely resembles the epithelium of patients who died of lung cancer."

In addition to these pathological changes in lung tissue, another study suggests changes in the brain. Campbell et al. (*16*), in December, 1971, reported that ten patients who had used cannabis regularly for periods ranging from 3 to 11 years, and whose average age was 22, showed clinical features of a chronic brain syndrome similar to encephalitis lethargica, with memory impairment, mood swings, headache and reversal of sleep pattern, and x-ray evidence on pneumoencephalogram of cerebral atrophy. They concluded that other drug use by these individuals was minimal and that there was no explanation for the cerebral atrophy other than cannabis use. Their findings have been challenged but have not, so far, been disproven.

CONCLUSION

A significant change occurs in the clinician's thinking and in his treatment approach when he begins to look at regular users of cannabis as at least in part suffering from a fluctuating, low-grade state of intoxication rather than as solely struggling to develop some new personality adjustment.

The personality change theory has been favored by a number of clinicians who described it variously as a movement towards an amotivational syndrome or a nonactivist role in relation to society. To some extent, regular users themselves, while generally denying that cannabis could be a factor, have accepted a similar identification of themselves as being antimaterialistic and rejecting of society's standards.

These changes are interesting in that they can be conveniently interpreted by clinicians as negative and by users as positive. For example, it is not too difficult to see how the description by West (*18*) given above in a clinician's words can be amended for use by some regular users—and even by some observers—who see in cannabis use a growth experience for the individual. The "diminished drive", "lessened ambition", "decreased motivation", and even "apathy" are interpreted as being a justifiable reaction to a materialistic society, which places heavy emphasis on money, aggression and resistance to change. "Magical thinking" and experiences of "derealization and depersonalization" as seen as creative steps towards finding oneself. The "diminished capacity to prepare realistically for the future" becomes a politically motivated rejection of society's values and goals. The "habit deterioration" takes on an entirely different meaning when it is seen as a return to nature.

The importance of at least initially taking an organically oriented approach to the regular user rather than conducting a psychodynamic exploration of his personality lies in its therapeutic application. As Al-Hariri implied in the Thirteenth Century (p. 100), there is not much point in trying to do psychotherapy with someone who is intoxicated. The state of intoxication must first be ended and then the emerging basic personality can be explored.

In practice, this first step can, not infrequently, be achieved with the regular cannabis user by any helping person who is alert to the possibility that a continuing biochemical process may be part of the observed phenomena. The clinician, in particular, should not assume that an individual's cannabis use is irrelevant to his seeking some kind of help, even for an apparently unrelated condition.

A careful inquiry into the actual extent and frequency of use, a detailed functional inquiry into the general physical state of the individual, and a detailed mental status examination of the individual user will not infrequently draw attention to the facts that (1) the user may be indulging in cannabis much more frequently than his initial "only on social occasions" statement would suggest, and (2) the drug does have persistent, fluctuating, low-grade effects in relation to his psychological or physical functioning.

If these insights can be brought out from the individual himself, he may then be agreeable to a trial discontinuation and even after a couple of weeks he may note sufficient improvement in himself that he concludes either to reduce his use considerably or even to discontinue use completely. In the light of the persistent, cautionary clinical material which indicates that cannabis is a long-acting intoxicant, even the former would appear to be a justifiable exercise in preventative medicine.

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[From Microgram, Vol. VII, No. 2, February 1974]

A considerable controversy has arisen in recent months regarding the taxonomic classification of marihuana.

Traditionally, marihuana has been regarded as being of the genus cannabis, species *sativa*, with several agronomic varieties recognized within that species among them *indica, americana, and ruderalis*. Drawing upon the body of knowledge prevailing at that time, the framers of the original Marihuana Tax Act in 1937 wrote the definition of marihuana which is still in use in the Uniformed Controlled Substances Act, to wit, ". . . all parts of the plant cannabis *sativa* L . . ."

Recently, however, Dr. Richard E. Schultes, Professor of Botany, Harvard University, has, as a result of research into the problem, arrived at the conclusion that there are at least three species of the genus cannabis—*indica*, and *ruderalis*, besides *sativa*. Although there are, in his view, sufficient basic taxonomic differences between the three to legitimately classify them as species, there are no constant differences in the resinous materials, most notably the tetrahydrocannabinol (THC) content from one to the other. Also, the exact species can only be determined if the whole plant is present for examination—a circumstance rarely encountered in a forensic situation.

As a consequence, given this hypothesis, it cannot be determined with legal certainty, on the average marihuana submission, whether or not cannabis *sativa*, among the three possibilities, is present. Allthough a technical description of Dr. Schultes' work is beyond the scope of this communication, its implications are clear. Dr. Schultes has appeared on many occasions as a defense expert witness. In a number of these occasions, his testimony has been rebutted by several expert botanists, most notable among them Dr. Ernest Small of the Central Experimental Farm, Biosystematics Research Institute, Canada Department of Agriculture, Ottawa, Canada.

One major contention of Dr. Schultes is that the entire subject of the classification of cannabis has not been fully explored or studied, and that the monotypic classification which is accepted by the bulk of the scientific community is done so out of a basic ignorance of the subject. Dr. Small, however, has conducted considerable research into this area, and has concluded that *sativa* is, indeed, the only species of cannabis. The results of his research have been submitted for publication to the U.N. Bulletin on Narcotics.

Although the consensus of the scientific community remains in favor of the monotypic classification, the issue will continue to be raised in court. Basically, it can be argued that:

1. Given the prevailing opinion at the time the legislation was written; given also the fact that any of the purported species contains THC, it was the intent of Congress to control marihuana, regardless of species.

2. The bulk of the scientific community still regards cannabis as monotypic. Dr. Schultes represents basically a minority viewpoint, and his research has been criticized by Dr. Small and others. Therefore, on a factual basis, *Cannabis* may be regarded as monotypic.

There are, at this time, three rulings on the Federal level on the monotypic nature of cannabis; the citations are as follows:

United States vs. John Moore (E.D.Pa. No. 69–137) 330 Fed. Supp. 684 (1970).

United States vs. Eric Honeyman, et al., (71–1035–RHS) Northern District, California, 1972.

United States vs. Mitchell Rothberg, et al., (7–SR–164) 351 Fed. Supp. 1115 (1972). Eastern District, New York.

The latter case was argued before Judge John R. Bartels, Sr., in the Eastern District of New York. It is interesting to note that after taking testimony for the defense from Drs. Schultes and William Klein, of the St. Louis Botanical Gardens, and Dr. Small for the prosecution, Judge Bartels retained the services of Dr. Arthur Chronquist of the New York Botanical Gardens, who performed a study of the conflicting testimony and other pertinent literature. His study convinced him that[1] ". . . the casual opinion that I had . . . has been very considerably firmed up as a strong opinion that there is only one species of cannabis."

To date, cases involving transfer or possession of marihuana have been dismissed on a local level in Dade County, Florida and Washington, D.C. In a recent decision, Judge Charles Halleck of the Superior Court of the District of Columbia, dismissed charges of possession of cannabis on the grounds that the statute failed to delineate the exact substance being proscribed; Judge Halleck had taken testimony from a botanist who recognized five different species of cannabis.

Although this controversy transcends the expertise of the forensic chemist or criminalist, he will be asked frequently, none the less, for advice from prosecutors faced with this defense. In these instances, they should be apprised of the general outlines of each hypothesis and supplied with the various precedents. Judges, for the most part, prefer to rule on issues such as this one on precedent, rather than break unfamiliar legal ground. Also, most jurists attempt to interpret the law in terms of the intent of the legislative branch at the time they wrote he law. These circumstances tend to produce rulings favorable to the prosecution on this issue. Clearly, given the fact that tetrahydrocannabinol exists in all varities of cannabis in amounts which have no direct bearing on the variety per se, this "species controversy" represents little more than an attempt on the part of the defense to utilize scientific research of a relatively academic nature to introduce a technicality into legal proceedings involving this drug substance. In support of this viewpoint, Dr. Small has stated, "[T]he consensus among botanical taxonomists [is] that "species" are arbitrary subjective units, whose comprehensiveness depends simply on how the units are defined."[2]

MARIHUANA AND THE RADICAL LEFT

[Excerpts from the "Anarchists Cookbook"]

The Anarchist Cookbook

(By William Powell, with a prefatory note on Anarchism Today by P. M. Bergman)

FOREWORD

This book is for the people of the United States of America. It is not written for the members of fringe political groups, such as The Weathermen, or The Minutemen. Those radical groups don't need this book. They already know everything that's in here. If the real people of America, the silent majority,

[1] Transcript of testimony of Arthur Chronquist before Judge John R. Bartels, Sr., Federal District Court, Eastern District, New York, November 14, 1972.

[2] Private communication, March 5, 1974.

are going to survive, they must educate themselves. That is the purpose of this book.

In this day and age, ignorance is not only inexcusable, it is criminal and perhaps fatal. *The Anarchist Cookbook* is not a revolutionary work in itself, just as a gun cannot shoot, but I have a sincere hope that it may stir some stagnant brain cells into action. If the people of the United States do not protect themselves against the fascists, capitalists, and communists, they will not be around much longer. Do I sound like an alarmist? Follow the process of disintegration: from the most immediate capitalist pollution; through the rising inflation, which is creating an atmosphere ripe for communism; to the final repression of the people by the fascists in power.

Maybe I use the term revolution too frequently in this book, without really defining it. I will do so here. I do not particularly like any form of government but, if the majority of the people seem to think that they are incapable of governing themselves and want a government, then I think the principles the United States was born with are about the best there are. So now revolution comes to mean revitalization, bringing America back to where she was two hundred years ago. This is the first time I've thought of myself as a reactionary.

I believe that the people in power—not only political power, but also economic and social power—will not nonviolently give up that power to the people. Power is not a material possession that be given, it is the ability to act. Power must be taken, it is never given.

I hope that, by the time the two hundredth anniversary of The First American Revolution rolls around, we will be able to look back at the sixties and early seventies as a dark era in the great history of a free nation.

INTRODUCTION

The human race, throughout its long history, has always tried to uncover the meaning or essence of certain ideas or concepts according to their particular frames of reference. This is also true of the twentieth century, but man is traveling so fast and his frame of reference is becoming so large that it is almost impossible to keep up with it. Throughout history, persons have attempted to redefine and put dated definitions to currently prevalent questions: This also has become increasingly difficult in this age of massive technological discoveries coupled with a perpetual information and propaganda bombardment by the media. So I feel that an attempt on my part to redefine anarchy in terms of the twentieth century would be a pointless task. Such a pastime is best left to the politicians and the academicians.

This is not the age of slender men in black capes lurking in alleyways with round bombs, just as it is not the age of political discussions in a Munich beer hall. This is a truly unique age, where the individual has become the supreme agent of anarchist theory, without his even being aware of it. Anarchy can no longer be defined as freedom from oppression or lack of governmental control. It has gone further than that. It has become, especially in the young people today, a state of mind, an essence of being. It can be expressed as "doing their own thing," or maybe just simply having the choice to do or not to do.

Anarchy or anarchistic theory is the only ideology that is in the least bit optimistic. It places the full weight of responsibility where it should be—on the shoulders of all the people, not just the select few. Its basic premise relies on an unshakable faith in human nature, and the primary goodness of the human race.

Today, young people are not blind idealists. They are perhaps the most rational and practical generation this country has ever seen. There is no great movement comparable to the Russian or French revolutions. There are just a great many indivduals working as entities unto themselves, to create a new world order. Today has brought forth a great revival of anarchy in all fields: politics, arts, music, education, and even to a small degree in business. Although this surge of individualism is present, you won't find too many people willing to call it anarchy. But that's just terminology.

An anarchist is not necessarily a revolutionary, although it is more common than not that a person who has attempted to rid himself of exterior controls, for the purpose of developing his own philosophy, will find himself oppressed.

This oppression may lead the individual to formulate ideas of insurrection and revolution.

This book is for anarchists—those who feel able to discipline themselves—on all the subjects (from drugs, to weapons, to explosives) that are currently illegal and suppressed in this country. It is my firm belief that the only laws an individual can truly respect and obey are those he instills in himself. This is not a revolutionary book in any traditional sense, but its premise is the sanctity of human dignity. If this human individual dignity and pride cannot be attained in the existing social order, there is only one choice for a real man, and that is revolution.

There will never be a traditional revolution in this country, in the sense of the Russian or French revolutions. The revolution in this country has already started. It is a multi-faceted battle on many different fronts. It is a battle politically between the young freedom fighters in Chicago and the stagnant system, represented by arthritic old men making laws they do not understand, and making wars they have no feeling for. It is a battle between the poor blacks and the rich employers. It is a battle between the artists and the censors. It is a battle between the Black Panthers and the police. It is a battle between the welfare mother and the bureaucracy of the city, and suprisingly enough it encompasses the yearly battle between the taxpayer and the Internal Revenue Service. All these battles are but part of a larger war, being fought to liberate the minds and bodies of the people who feel freedom is the most important concept in their lives.

If I could come out in this book and advocate complete revolution and the violent overthrow of the United States of America, without being thrown in jail, I would not have written *The Anarchist Cookbook*, and there would be no need for it.

Read this book, but keep in mind that the topics written about here are illegal and constitutes a threat. Also, more importantly, almost all the recipes are dangerous, especially to the individual who plays around with them without knowing what he is doing. *Use care, caution, and common sense.* This book is not for children or morons.

POT LOAF

1 packet onion soup mix
1 (16 oz.) can whole peeled tomatoes
½ cup chopped grass
2 lbs. ground beef
1 egg
4 slices bread, crumbed

Mix all ingredients and shape into a loaf. Bake for one hour in 400-degree oven. Serves about six.

CHILI BEAN POT

2 lbs. pinto beans
1 lb. bacon, cut into two-inch sections
2 cups red wine
4 tablespoons chili powder
½ clove garlic
1 cup chopped grass
½ cup mushrooms

Soak beans overnight in water. In a large pot pour boiling water over beans and simmer for at least an hour, adding more water to keep beans covered. Now add all other ingredients and continue to simmer for another three hours. Salt to taste. Serves about ten.

BIRD STUFFING

5 cups rye bread crumbs
2 tablespoons poultry seasoning
½ cup each of raisins and almonds
½ cup celery
⅓ cup chopped onions
3 tablespoons melted butter
½ cup chopped grass
2 tablespoons red wine

Mix it all together, then stuff it in.

APPLE POT

4 apples (cored)
½ cup brown sugar
¼ cup water
4 cherries
⅓ cup chopped grass
2 tablespoons cinnamon

Powder the grass in a blender, then mix grass with sugar and water. Stuff cores with this paste. Sprinkle apples with cinnamon, and top with a cherry. Bake for 25 minutes at 350 degrees.

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POT BROWNIES

½ cup flour
3 tablespoons shortening
2 tablespoons honey
pinch of salt
¼ teaspoon baking powder
½ cup sugar
2 tablespoons corn syrup
1 egg (beaten)
1 tablespoon water
½ cup grass
1 square melted chocolate
1 teaspoon vanilla
½ cup chopped nuts

Sift flour, baking powder, and salt together. Mix shortening, sugar, honey, syrup, and egg. Then blend in chocolate and other ingredients, mix well. Spread in an eight-inch pan and bake for 20 minutes at 350 degrees.

BANANA BREAD

½ cup shortening
2 eggs
1 teaspoon lemon juice
3 teaspoons baking powder
1 cup sugar
1 cup mashed bananas
2 cups sifted flour
½ cup chopped grass
½ teaspoon salt
1 cup chopped nuts

Mix the shortening and sugar, beat eggs, and add to mixture. Separately mix bananas with lemon juice and add to the first mixture. Sift flour, salt, and baking powder together, then mix all ingredients together. Bake for 1¼ hours at 375 degrees.

SESAME SEED COOKIES

3 oz. ground roast sesame seeds
3 tablespoons ground almonds
¼ teaspoon nutmeg
¼ cup honey
½ teaspoon ground ginger
¼ teaspoon cinnamon
¼ oz. grass

Toast the grass until slightly brown and then crush it in a mortar. Mix crushed grass with all other ingredients, in a skillet. Place skillet over low flame and add 1 tablespoon of salt butter. Allow it to cook. When cool, roll mixture into little balls and dip them into the sesame seeds.

If you happen to be in the country at a place where pot is being grown, here's one of the greatest recipes you can try. Pick a medium-sized leaf off the marihuana plant and dip it into a cup of drawn butter, add salt, and eat.

[From the Berkeley Barb, May 20, 1966]

Turn On/Tune In/Drop Out

(By Timothy Leary PhD)

INTRODUCTION

This is the first of a series of columns by Timothy Leary, Ph.D. spelling out a theory and method of becoming a conscious person. The blue-print for a new religion. The working plan for a new species. The subsequent columns will present detailed, practical, day-by-day, step-by-step instructions, for rearranging your life, for establishing a harmony with your nervous system, your cells, your molecules and the multiple energy networks around you.

The lessons are designed to be decoded at several levels of consciousness. They can be read when you are in a state of routine symbolic awareness. They can (and should) be read when your symbolic mind is turned down and your sense organs are turned on.

Check these words out with your naked sense endings; check them out against your cellular wisdom.

Lesson I

Turn on!
Tune in!
Drop out!

Lesson II

Turn on to your seven external sense organs and your seven internal sense organs. Turn on to your cellular wisdom. Turn on to your molecular blue-prints.

Tune in to the natural energy that covers this planet.

Drop out. Your body is not designed to deal with metal, stone, symbols, machinery. Start an orderly, peaceful sequence of detaching yourself from artifacts. Your symbol-addicted society tells you to turn off, cash in, cop out.

Your cells tell you to turn on, tune in, drop out.

Lesson III

Turn on! The human body is a galaxy of energy systems, memory banks, communication networks. The current model of a billion-year experiment in receiving, decoding and harmonizing with energy. The history of evolution is stored in DNA strands buried in your cells and available to consciousness. It is possible for the knowledgeable person to move consciousness precisely and planfully to these various levels. You can "turn on" with or (partially) without chemicals. In the next few months in these columns I shall teach you how.

Tune in! The human body is designed to adapt smoothly to the other energy systems in this planet. After you "tune in" you must be able to hook-up your expanded consciousness in a harmonious flow with the external world. In the next few months in these columns I shall teach you how to rearrange your movements and your environment.

Drop out! Modern civilization is a dangerous, insane process-destructive of man's natural potential, murderous to other species of life, symbol addicted, anti-life. Drop out of the social game.

The generation of Americans under the age of thirty is a mutant species, sharing territory with a dangerous, deviant species (i.e. those over the age of thirty who are addicted to power, control and violence). To preserve your sanity and return to harmonious order you must quit your attachments to American society gracefully, lovingly, planfully.

Quit school. Present education methods are neurologically crippling and antagonistic to your cellular wisdom. Quit school internally by turning on and tuning in. When you have done this (and not before) quit school. For good.

American social institutions are made by robots for robots—lustful of and observed by materials, things, dead symbols. Quit your job internally and then (and not before) quit your job. For good.

It is possible to live in this planet without joining the anti-life social systems. I shall teach you how.

Exercise I

Go into a serene environment—a quiet room, a hillside, a beach, a garden.

Bring with you an unopened tin can, a candle, a piece of fruit (sliced open so the seed is visible). Have one shoe on and the other foot bare.

Observe these three objects and meditate on the fact that your body is two billion years old.

[From Disorientation: Notes from the Underdog]

Drugs

"Some people would eat cow manure if someone said it would get them high. At least it would kill them slowly."—Berkeley BARB

Drugs are an integral part of the culture, the life style, and the day-to-day living of Berkeley. But that does not mean there are no problems or that there aren't some important things to say about drug use.

The heavy stuff should probably be first. There are drug busts everywhere, of course, but in Berkeley it's particularly tough. The establishment doesn't really care that much about the drugs—it is the culture and politics with which drugs are associated that trouble 'The Man.' He knows that they all are connected.

What can you do to protect yourself:

(1) The key thing is not to give the cops an excuse ("probable cause") for searching your house or car. One important thing in this respect is the smell

of pot—it carries a long way and judges accept this as reason for a search without warrant. Burn incense, keep windows closed, stay away from rooms near the street, etc.

(2) Stopping people in cars is common under the excuse of some minor traffic violation, real or not. If this happens, driver should get out and walk to the cop car while people in the car get rid of the evidence.

(3) Buy from dealers that you know personally. Making these precautions a natural part of the drug ritual will pay off.

"Burns" do happen in Berkeley, but they can be avoided by: (1) Knowing your dealer; (2) Staying ahead of your supply so you can try stuff before you buy; (3) Watching the underground rags for drug prices and markets so you know fair prices. Watching out for fake grass, grass weaker than it's 'advertised to be,' and acid, mescaline, etc., cut with bad shit (some acid is being cut with strychnine, a fine high but a poison and potentially addictive). Unfortunately, "burns" are being systematically organized by the "Mafia" (the underground capitalists).

"Your mind might think it's flying, baby, on those little pills, but you ought to know it's dying "cause speed kills"—Canned Heat. Not only have speed, heroine, and barbituates messed up people badly, but they can also destroy the community. It was a speed-heroine-Mafia combination that turned beautiful Haight into the horror it is today and the threat is increasing on the Berkeley scene. Pot, acid, mescaline, psilocybin are the drugs of revolutionary people; speed and heroine are the last gasp of decayed death trip America.

Good vibes now. Well, everybody has their own tastes, but acid still seems to be the best, most complete trip. Mescaline is like acid but less a mind trip, "milder" and a good pot-to-acid transition. Psyilocybin is hard to come by, but worth an effort. Take good old dramamine before a mescaline trip and avoid the stomach discomfort that sometimes occurs. M.D.A. is a new kind of mescaline, a very very heavy mind trip that you have to be prepared for but an incredible experience. Taking heavy drugs outside, especially in one of the fantastic parks around, is almost always more far-out and an almost sure guarantee of a good trip for the first time.

Bad trips. Keep with you the various numbers listed in the underground papers for help—especially the Free Clinic and the various switchboards. Avoid giving or taking any drugs to deal with a bad trip. This is especially serious in the case of thorizine, which will probably be fatal if there was any STP in what you originally took. Milder tranquilizers like Librium are OK but the best cure is to *talk* somebody down. Reassure them, calm them, tell them that you've had similar experiences and come out okay, etc. If it's you on the bummer, find somebody to talk to, try to be calm, look around you for things to groove on, try and groove on things that are burning you.

Society hates drugs because they can give people ideas and visions of beauty and love that make them realize that this current society has to be brought down and totally rebuilt. The final "burn" is when you let your trips all become "commercialized" or escapist. Escapist trips become a necessity sometimes, and "psychedelic" trips with candles, glow balls, etc. can be fun but if that's all that drugs mean, then society has kept you within its box—even on drugs.

"We will continue to use drugs to inspire us to new visions of life knowing that these visions can only be realized through revolutionary action"—Berkeley Liberation Program. Freak out, dig it, and fight for a world where it is not a bummer to come down.

RESOLUTION ON CANNABIS OF THE GENERAL COUNCIL OF THE CANADIAN MEDICAL ASSOCIATION AT ITS 105TH ANNUAL MEETING IN MONTREAL, P.Q.—JUNE, 1972

Moved by: C. J. Schwarz, British Columbia
Second by: W. J. Corbett, British Columbia
Motion:

Whereas the Commission of Inquiry into the Non-Medical use of Drugs, like the similar national study groups in Britain (the Wootton Committee, 1968) and the United States (the National Commission on Marihuana and Drug Abuse, 1972) has clearly presented adequate evidence for its general conclusion that in relation to cannabis there must be "A continuing policy to discourage its use"

(p. 301) on the grounds of individual and public health concerns and whereas the commission based this conclusion on evidence which led to the following statement in its report "To sum up, then, it seems to us that there are at least four major grounds for social concern: The probably harmful effects of cannabis on the maturing process in adolescents: The implications for safe driving arising from impairment of cognitive functions and psychomotor abilities, from the additive interaction of cannabis and alcohol, and from the difficulties of recognizing or detecting cannabis intoxication; the possibility suggested by reports in other countries and clinical observations on this continent, that the long-term, heavy use of cannabis may result in a significant amount of mental deterioration and disorder: the role of cannabis in the development and spread of multi-drug use by stimulating a desire for drug experiences and lowering inhibitions about drug experimentation." (p. 274) and whereas the commission indicates elsewhere in its reports that (A) there is growing concern that tolerance can develop to cannabis with some individuals requiring stronger preparations or increased amounts (pp. 119–213); and (B) that there is already appearing on the Canadian scene a significant shift from marihuana to hashish (pp. 169 and 188). Be it resolved that: In view of the above serious indicators of hazard to health, the Canadian Medical Association is prepared to give the following explicit guidance to the public at this time:

1. Our collective medical opinion is that the adolescent and adult public should now be clearly advised against the informal use of cannabis, either in the form of marihuana or hashish.

2. Those who disagree with this advice are urged to take the following steps:

(A) Familiarize themselves with the cautionary medical reports on cannabis contained in the Canadian, British and American commission reports of recent years.

(B) Refrain from encouraging others to use cannabis and specifically avoid introducing new individuals to it.

(C) Users should undertake, if necessary with the help of a physician, an objective review of their own mental and physical functioning with respect to their use of cannabis.

Resolution on Cannabis of the General Council of the Canadian Medical Association at Its 106th Annual Meeting in Vancouver, B.C.—June, 1973

Moved by: Dr. K. Hill
Seconded by: L. Cunningham

That a new resolution be offered as follows:

Whereas recent and ongoing studies of the long term effects of cannabis support the persistently cautionary clinical opinions of physicians over the years and reinforce the conclusions of the recent national commission studies in Canada, Britain and the United States, that the use of cannabis should be discouraged on grounds of individual and public health concerns, Be it

Resolved, that the C.M.A. reaffirms its 1972 annual meeting resolution and clearly advises the Canadian public against the non-medical use of cannabis.

Biographical Notes of Department of Defense Witnesses

David O. Cooke, Deputy Assistant Secretary of Defense (Administration)

Mr. Cooke has been involved in Defense management since 1958 when he was a member of Secretary of Defense McElroy's task force on reorganization which led to the passage of the DoD Reorganization Act of 1958. In 1959 he developed a DoD policy reference book for Secretary of Defense Gates and in 1960 served on special DoD reorganization study groups under Mr. Gates.

In January 1961 Mr. Cooke was assigned to the Office of Organizational and Management Planning which Secretary McNamara established upon assuming office. This was the office which did much of the preliminary work leading to the major organizational changes that have taken place within the DoD since 1961. In the summer of 1964 Mr. Cooke assumed the position of Director of Organizational and Management Planning within the Office of the Assistant Secretary of Defense (Administration). On January 31. 1969 Mr. Cooke became the Deputy Assistant Secretary of Defense (Administration) under the Assistant Secretary of Defense (Administration). When the latter position was disestablished. he was transferred to his present position under the Assistant Secretary of Defense (Comptroller).

Mr. Cooke is a graduate of New York State University College at Buffalo, New York (B.S., 1941) and received an M.S. from New York State University at Albany, New York in 1942. He received his law degree from the George Washington University Law School in 1950 where he was a member of the Law Review and Order of the COIF. He is a member of the District of Columbia Bar, the District of Columbia Court of Appeals, and the Court of Military Appeals.

Mr. Cooke is a retired Captain, United States Navy. During his active duty he served is a wide variety of assignment mainly involving legal duties.

Mr. Cooke is married to Marion McDonald Cooke, also a lawyer. They have three children: Michele, Lot and David. He currently resides at 1412 23rd Road South, Arlington, Virginia.

Mr. Cooke is a member of the American Bar Association, the U.S. Maritime Law Association, the Federal Bar Association, and the Armed Forces Management Association. Recently, he was appointed to the General Administration Board, Graduate School, U.S. Department of Agriculture.

By virtue of his very high level experience in the Pentagon since 1957, Mr. Cooke is familiar with Defense problems across the board and has developed close personal relationships with most of the present civilian and military leaders within DoD.

JOHN F. MAZZUCHI, PH. D., STAFF ASSISTANT FOR EDUCATION AND INFORMATION OFFICE OF DRUG AND ALCOHOL ABUSE PREVENTION

Date and place of birth—

June 28, 1940—Washington, D.C.

Education—

BA (English)—University of Notre Dame, Notre Dame, Indiana—1962.

MA (Counseling)—The Catholic University of America, Washington, D.C.

Ph.D. (Counseling)—The Catholic University of America, Washington, D.C.

Employment—

Marianapolis Preparatory School, Thompson, Connecticut, 1962 to 1967—Chairman of the Department of English; Dean of Studies; and School Counselor.

The Heights, Washington, D.C., 1969 and 1971—Instructor in the Summer Seminar Program and Counselor for the Community Study Program.

The Catholic University of America, Washington, D.C., 1971 and 1972—Graduate Teaching Assistant and Director of the Student Practicum in Counseling.

Naval Personnel Research and Development Laboratory, Measurements Division, Washington, D.C., 1972 to 1973—Counseling Research Psychologist in the areas of Drug Abuse and Career Development.

Office of the Deputy Assistant Secretary of Defense for Drug and Alcohol Abuse, Washington, D.C., 1973 to Present—Administrative Specialist for Drug and Alcohol Abuse Education and Information.

Memberships—

Professional—The American Personnel and Guidance Association and The National Vocational Guidance Association.

Civic—Board of Directors, Americana Center Community.

Publications—

The Marine Assignment Preference Schedule, Revised (MAPC). Approved for use by the United States Marine Corps. 1972.

The Review of In-Country Experiences (revice). Approved for use by the Department of the Navy. 1972 Co-author.

Determining the Attitudinal and Personality Correlates of Drug Abuse. Paper presented at the National Convention of the American Personnel and Guidance Association, San Diego, California. 1973 Co-author.

A Multivariate Comparison of Drug Users and Non-Users. Arthur C. F. Gilbert and John F. Mazzuchi, Naval Personnel Research and Development Laboratory, Washington, D.C. 1973.

Granting Occupational Preference To Marine Recruits: A Solution or A Problem? John F. Mazzuchi and Arthur C. F. Gilbert. The Vocational Guidance Quarterly (In Press).

Present duties—

Staff Assistant for Drug Education and Information. Primary Duties: to participate in overall planning of goals and objectives for DoD drug and alcohol abuse educational and information programs; to develop and coordi-

nate policies and programs relating to the training of military personnel in the fields of drug and alcohol abuse prevention and control and drug and alcohol rehabilitation and counseling; to develop new and revised educational material for approval of supervisors and review committees; to review reports, make surveys and develop evaluative criteria to assess the effectiveness and relevance of materials in use. Secondary Duties—to maintain contact with other federal agencies as well as other OSD elements and Service education and training representatives on behalf of the Deputy Assistant Secretary to exchange views and information; to assist in the development of materials for release through OIAF and public media; to review for quality and relevance drug and alcohol prevention films, pamphlets and other materials; to make on sight visits to military bases to assist in the development and implementation of drug and alcohol education programs.

BRIG. GEN. WILLIAM A. TEMPLE

Brigadier General William A. Temple is Director of Special Investigations and Commander of the Air Force Office of Special Investigations.

General Temple was born in Philadelphia, Pa., on Dec. 13, 1924. He attended Indiana University for one year prior to entering the United States Military Academy, West Point, N.Y., in 1943, from which he graduated with a bachelor of science degree and commission as second lieutenant in 1946. He has a bachelor of laws degree, 1951, and a master's degree in international relations, 1964, from George Washington University.

While a cadet at the Academy, he attended flying training and received his pilot wings in 1946. He then went to multiengine transition flying school and in November 1946 was assigned as a design and development officer with the Air Proving Ground Command at Eglin Army Air Field, Fla. From August 1948 to July 1951 he attended the University of Minnesota for two years and then George Washington University for one year where he received his law degree.

General Temple then was named Assistant Judge Advocate for the Alaskan Air Command with headquarters at Elmendorf, Alaska. In August 1953 he was transferred to Headquarters Military Transport Service at Andrews Air Force Base, Md., where he was Assistant Chief Pilot. From February 1955 to July 1958, he served as a Legislative Liaison action officer in the Office of the Secretary of the Air Force.

He next attended B–47 Stratojet combat crew training and was transferred to Homestead Air Force Base, Fla., where he served as B–47 aircraft commander and operations officer in the 527th and 524th Bombardment Squadrons. In July 1960 he was assigned to Headquarters Strategic Air Command (SAC) at Offutt Air Force Base, Nebr., in the Directorate of Personnel where as Chief of Boards he was responsible for the separation and board branch and flying status branch. He entered the Air War College at Maxwell Air Force Base, Ala., in August 1963.

After completion of B–52 Stratofortress combat crew training at Castle Air Force Base, Calif., in November 1964, he was assigned to the 6th Strategic Aerospace Wing at Walker Air Force Base, N. Mex., as Chief of the Programs and Scheduling Branch and later was Chief of the Training Division.

General Temple returned to the Pentagon in March 1966 and was assigned to the Office of the Secretary of Defense as an assistant for manpower and reserve affairs. In November 1968 he was transferred to Griffiss Air Force Base, N.Y., as Vice Commander of the 416th Bombardment Wing and later was Commander. His next assignment was in May 1970 at McCoy Air Force Base, Fla., as Commander of the 306th Bombardment Wing.

General Temple joined the Air Force Office of Special Investigations (OSI) in August 1971, attended the Special Investigators Course, and served as Deputy Director of Special Investigations. He became Director of Special Investigations and Commander, Air Force Office of Special Investigations, in April 1972.

His military decorations and awards include the Legion of Merit with one oak leaf cluster and the Air Force Commendation Medal with one oak leaf cluster. He is a command pilot.

General Temple is married to the former Geraldine Henderson of Pansey, Ala. They have five sons: John; Michael; Scott; and twins, David and Donald.

He was promoted to the grade of brigadier general effective August 1, 1972, with date of rank July 12, 1972 and has been selected for promotion to the grade of major general.

COLONEL FRANK W. ZIMMERMAN, JR.

Native Texan.

Received MD degree from University of Texas Medical Branch, Galveston, Texas, 1959.

Completed a general rotating internship at Wilford Hall USAF Medical Center, Lackland AFB, TX, 1960.

Completed residency training in Neurology and Psychiatry at University of Texas Medical Branch, Galveston, 1963.

Certified by the American Board of Psychiatry and Neurology in 1966.

Served as Chief, Inpatient Psychiatric Service, USAF Hospital Wiesbaden, 1963–67.

Served as Chief, Mental Health Services Branch, USAF Medical Center Wright-Patterson, Wright-Patterson AFB, Ohio, 1967–70.

Came to Washington as Consultant in Psychiatry to AF Surgeon General July 1970.

Elected Fellow, American Psychiatric Association, 1971.

DAVID N. PLANTON (GS–14), NAVAL INVESTIGATIVE SERVICE

Mr. David N. Planton was born in Ohio in 1925, and immediately following graduation from high school, he enlisted in the U.S. Navy in 1943 as a seaman recruit, through the V–12 program. He began his commissioned career in the Navy following his graduation from Marquette University in 1945. While on active duty, Mr. Planton served on various ships, but resigned from active duty in 1948 to seek employment in the intelligence field.

His employment as a civilian Special Agent with Naval Intelligence began at Jacksonville, Florida in 1950 and he has had a steady progression within the Naval Investigative Service since that time as a criminal and counterintelligence investigator. Past key assignments have been as the Assistant Supervising Agent, Naval Investigative Service Office at Charleston, South Carolina, and as the Supervising Agent of the Naval Investigative Service Office in New York City.

Since January 1972, Mr. Planton (GS–14) has been the Head of the Criminal Division of the Naval Investigative Service Headquarters at Alexandria, Virginia. In this position, he exercises technical direction, coordination, and control of Naval Investigative Service resources in all operational activities involving criminal matters and plans, coordinates and provides technical supervision of criminal intelligence and neutralization programs with the mission of the Naval Investigative Service.

Mr. Planton will report as the Supervising Agent of the Naval Investigative Service Office in the Philippines in July 1974.

He retired from the Naval Intelligence Reserve in June 1973, as a Captain, after nearly thirty years of Naval Service. He is married to the former Norma Voncile Reid, of Jacksonville, Florida, and they have four children and two grandchildren.

STANLEY J. KREIDER, COMMANDER, MEDICAL CORPS, U.S. NAVY

Present assignment—Assistant Head, Psychiatry Branch, Professional Division, Bureau of Medicine and Surgery, Navy Department, Washington, D.C.

Previous military assignments—Naval Aviation Cadet, 1954–1955; Designated Naval Aviator, September 1955; Attack Squadron Eighty-Six, 1955–1959; Attack Squadron Forty-Three, 1959–1960; and Fighter Squadron 725 (Reserve), 1961–1964.

Education—Illinois Wesleyan University, B.A., 1961 and University of Chicago, M.D., 1965.

Professional training—Rotating Internship, Naval Hospital, Great Lakes, IL, 1965–1966 and Psychiatry Residency, Naval Hospital, Philadelphia, PA, 1966–1969.

Professional assignments—Staff Psychiatrist, Naval Hospital, Philadelphia, PA, July 1969–October 1969; Chief of Psychatry, Naval Support Activity Hospital, Danang, Republic of Vietnam, November 1969–May 1970; Division Psychiatrist, First Marine Division, Danang, Republic of Vietnam, May 1970–July 1970; Head, Mental Health Unit, and Senior Assistant Medical Officer,

Medical Department, U.S. Naval Academy, Annapolis, MD, 1970–1973; and Bureau of Medicine and Surgery, 1973–present.

Professional activities—American Medical Association; Association of Military Surgeons of the United States, Aerospace Medical Association; and American Psychiatric Association.

COLONEL HAROLD TUFTS, MILITARY POLICE CORPS, UNITED STATES ARMY COMMANDER, UNITED STATES ARMY CRIMINAL INVESTIGATION COMMAND

Henry H. Tufts was born at Salem, Massachusetts, on 13 September 1917. Following graduation from Peabody High School, Peabody, Massachusetts, he attended Suffolk University, Boston, Massachusetts, graduating with a Juris Doctor Degree in 1942.

His military career began on 3 February 1942 when he enlisted in the regular Army. He served as a Corporal in the Field Artillery until he graduated from Officer Candidate School on 3 December 1942 and was commissioned a Second Lieutenant of Field Artillery.

From December 1942 until December 1944 he was assigned battery duties with the 18th and the 693rd Field Artillery Battalion at Fort Sill, Oklahoma. With the 693rd he prepared for overseas movement at the Desert Training Center at Camp Iron Mountain, California. He was promoted to First Lieutenant before deploying to the European Theater of Operations in Janury 1945. While serving in the European Theater he commanded a battery of the 868th Field Artillery Battalion. He returned to the United States in November 1945 and was separated from active duty in January 1946.

He reentered active duty in November 1947 as a First Lieutenant, Military Police Corps. His first duty assignment was to the Military Police School Advanced Course, then at Carlisle Barracks, Pennsylvania. Upon graduation from the course he was assigned duties as a member of the Military Police School Faculty. Initially assigned as an instructor in the Law Section of the Investigations Department, he later became Chief of the Law Section. In January 1949 he was promoted to Captain. In October 1950 he moved with the Military Police School to Camp Gordon, Georgia.

He remained with the Military Police School at Camp Gordon until August 1952 when he was reassigned to the Provost Marshal Section of Headquarters, U.S. Forces Austria. In this assignment he performed duties as a Military Police Officer and was later assigned as the Assistant Provost Marshal of the Command. He was promoted to Major in 1953. In June 1955 he returned from overseas service to attend the Army Command and General Staff College at Fort Leavenworth, Kansas. Following graduation from this school in 1956 he was assigned duties as the Provost Marshal and Commanding Officer of the New England Military Police Detachment with Headquarters in Boston, Massachusetts.

In November 1957 he was assigned as a personnel staff officer in the Office of the Deputy Chief of Staff for Personnel, Headquarters, Department of the Army, Washington, D.C. He was promoted to Lieutenant Colonel in July 1960.

In July 1962 he was assigned as Provost Marshal of the 1st Cavalry Division in Korea. In July 1963 he was reassigned to Headquarters, United States Army Pacific in Hawaii where he was assigned duties as Theater Provost Marshal. He was promoted to Colonel in July 1966.

In 1967 he was reassigned to the Military Police School at Fort Gordon, Georgia. His initial assignment was as Director of Instruction. This was followed later by duty as both Assistant Commandant and Commandant of the Military Police School.

In November 1968 he was reassigned to Headquarters, Department of the Army to be the Chief of the Planning Group for the centralization of CID activities in the Army. In August 1969 he became the first Commanding Officer of the United States Army Criminal Investigation Agency. In September 1971, he became the first Commanding Officer of the United States Criminal Investigation Command, a worldwide investigatory body with Headquarters in Washington, D.C.

Colonel Tufts was retired from the Regular Army in August 1971. Following his retirement, he was immediately recalled to active duty at the direc-

tion of the President to continue serving as Commanding Officer of the Criminal Investigation Command.

In addition to numerous campaign ribbons, Colonel Tufts has also been awarded the Distinguished Service Medal for outstanding performance of duty in a position of great responsibility. He also holds the Bronze Star Medal and the Army Commendation Medal.

Colonel Tufts is married to the former Margret Lawrence. They have 3 children. They reside at 8509 Etta Drive, Springfield, Virginia.

Col. John J. Castellot, Sr.

Col. John J. Castellot, Sr., MD., M.C. graduated from The University of Rochester in 1950 and The University of Rochester School of Medicine in 1954. He is a board certified specialist in internal medicine and a Fellow of the American College of Physicians. He served in the Army as an enlisted man in 1945–6 and has served as a Medical Corps officer from 1954 to the present time. He has served at several station and general hospitals in CONUS and Germany as a practicing internist. During 1971–2 he was the Medical Consultant for the U.S. Army in Vietnam and supervised the medical aspects of the alcohol and drug program there. Since his return in July 1972 Col. Castellot has occupied the position of Chief, Alcohol and Drug Policy Office, Office of the Army Surgeon General.

Colonel Wayne B. Sargent

Colonel Sargent graduated from the University of Florida in 1950 and entered the Regular Army as an Infantry Officer. He has served in combat in Korea and in the Republic of Vietnam. He has commanded a Mechanized Infantry Battalion in Germany, an Aviation Battalion in Vietnam and a Brigade of the 2nd Infantry Division in Korea. Colonel Sargent is a graduate of the Industrial College of the Armed Forces, completing that program in 1972. Since September 4, 1973, he has been the Chief of the Alcohol and Drug Policy Division, Office of the Deputy Chief of Staff for Personnel, Department of the Army.

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